January 1961

Electrical South

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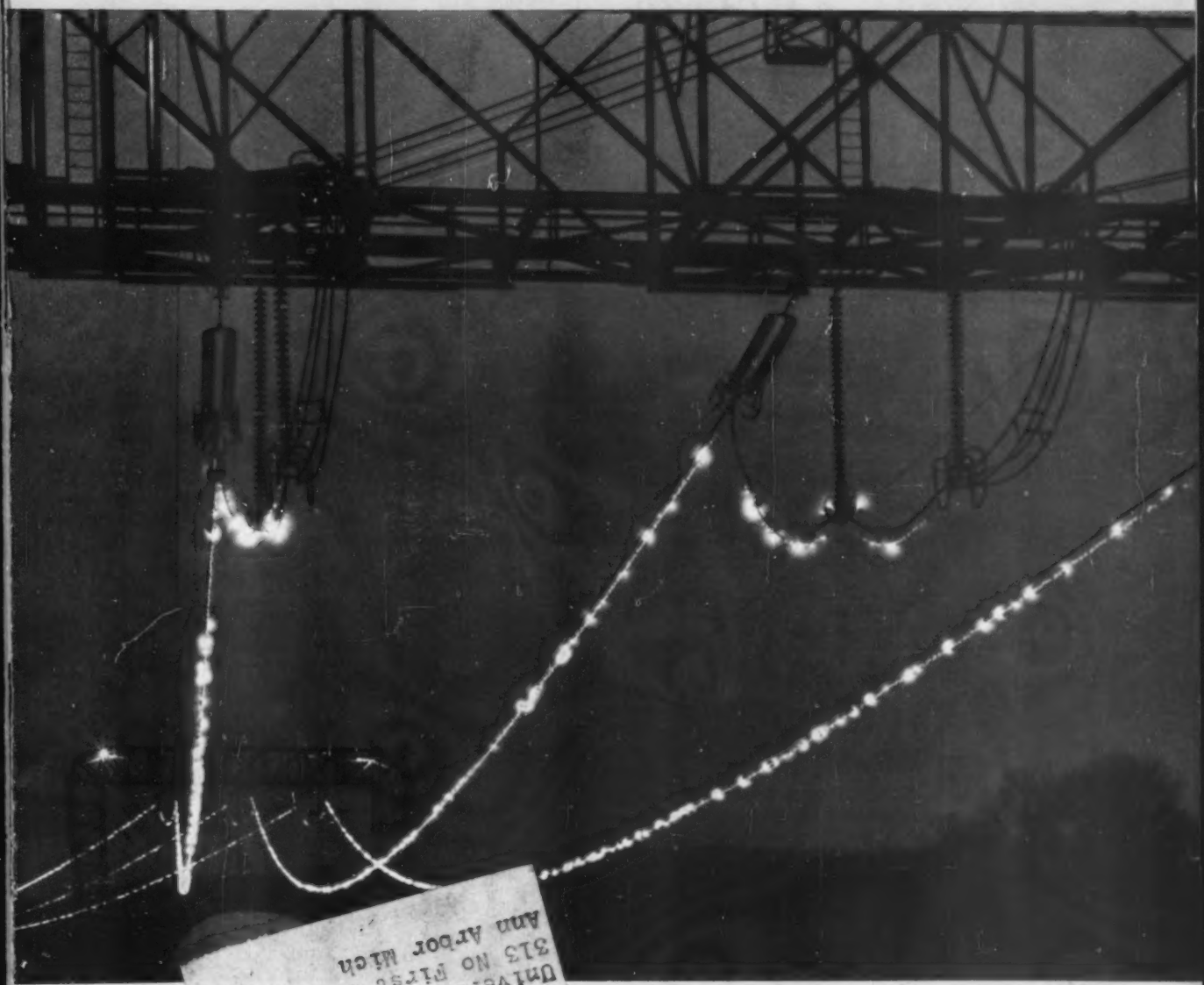

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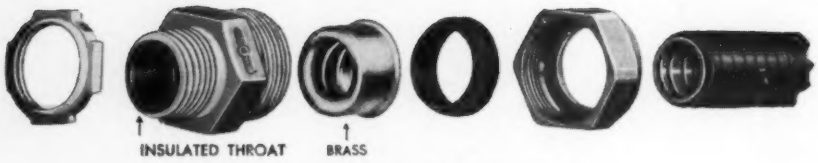

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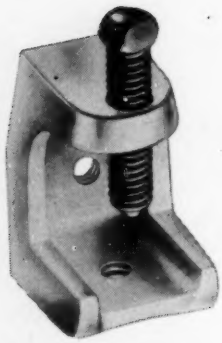

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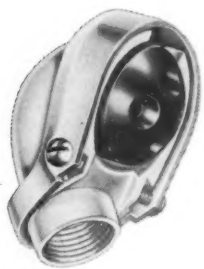

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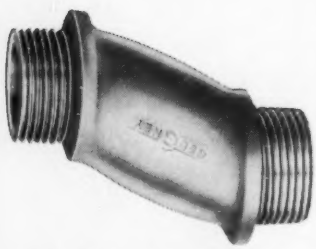

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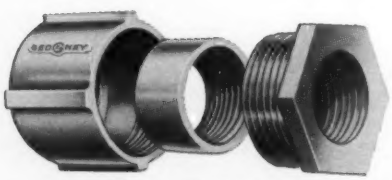

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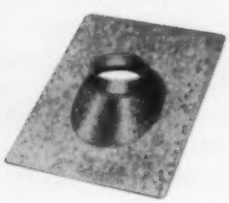

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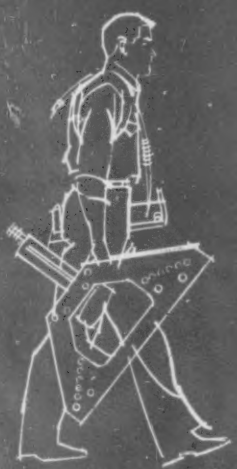

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Economic comment

by J. Whitney Bunting, Ph.D.
Contributing Economics Editor

Business activity decline brings corporate squeeze

Business activity, which continued to decline during the third quarter of 1960, showed no clear indications of a prompt turnaround.

Statistics of the United States Department of Commerce portrayed an unhappy picture of corporate earnings and consequent profit margins. These figures in themselves are not alarming for earnings are still being produced at a level of over $42 billion at an annual rate.

The real danger lies in the continued squeeze that corporate management feels as costs of operation continue to rise while earnings dip. Narrower profit margins will cause many industrialists to take a good hard look at expenditures in the next 12 months to determine the possibility of profitable returns.

Several of the major corporations have indicated that current conditions do not suggest the need for curtailment of such outlays as for plant construction, needed maintenance work, research and development, and automated processes of production. All of these are essential to a healthy competitive enterprise.

However, a continuation of this decline may cause even the stronger firms to take a second or revised look at expense plans. It is no secret that in times of dwindling returns all expenses that can be delayed or which do not contribute measurably to a reduction in other costs of operations will be scrapped, temporarily at least.

The economic results of this process of cost contraction go far beyond the corporation itself. In the case of plant expansion where new construction is indicated, the effect may concern an entire community because of its dependence upon the projected income from the construction work involved.

In the case of technological advance through the adoption of automated processes, such projects may be pushed to rather rapid completion because of the anticipated economics. The danger here is that persons normally displaced through such developments may find it difficult to get new employment opportunities. Under better economic conditions, the industry might well have aided the relocation of such personnel as a condition of employee cooperation in the project.

Needless to say, this is a problem that requires a considerable degree of corporate management statesmanship if the national economy is to be maintained at the present pace. Managers, of necessity, must insure the safety of investment in the company and cannot exercise their powers in a manner that might be disastrous.

Profit is certainly a prime incentive, and unwise expenditures, the long-run value of which cannot be proven, might seriously impair this objective. If management, through adequate study and analysis of economic trends, can honestly and fearlessly maintain normal expansion policies, then much of the danger of a deeper recession is removed.

Moreover, such expenditures can then be considered as an investment in the future of both the company involved and the nation. One important consideration, so often overlooked, is that private expenditures are far better in the long run than are the government aid programs that will surely come if the recession becomes more severe.

Horizon looked brighter

Only a month or two ago, the economic horizon appeared to be much brighter due to various attempts to ease credit and make installment buying more attractive. The claim was made that this action by monetary authorities would lead to increased sales activity in the areas of consumer durables (appliances, automobiles, radio and television, and other high value items with a relatively long life).

It was also expected that the easing of credit terms might well spark obsolescence of washing machines, dryers, refrigerators, and many other items. If funds are easier to obtain, the public would recognize a golden opportunity in this era of inflated conditions to acquire newer models with the many added refinements of the past few years.

Such a situation would be a lifesaver to the appliance industry that has been in the doldrums for most of 1960 due to heavy inventory accumulations. Both manufacturers and distributors have felt the effect of slow sales and expanding stockpiles.

Easier credit was also supposed to stimulate new home construction, particularly in the moderate income category. For some time, the difficulties of obtaining mortgage money at an attractive interest cost worked in favor of those persons with potentially large down payments available and with incomes that could bear higher interest dates. The person interested in the smaller home found that he was frozen out of the market due either to no mortgage funds available or the exorbitant interest rate charged.

Home market opportunity

As a result, home builders across the nation have repeatedly pointed out that this was a vast market that could easily open up if monetary supplies at fair cost could become available. Here again the opportunity is available for economic stimulation in 1961.

Unfortunately, after a brief flurry of installment buying shortly after the credit restrictions were removed, a steady decline in installment buying has been developing. The basic cause most often attributed to this condition has been the consumer fear of more serious economic conditions to come. In other words, the buyer is retaining the cash that he has in hand or is engaged in curtailing the amount of installment credit already established. In either case, the consumer is now showing a lack of confidence in the immediate economic future.

(Continued on page 104)

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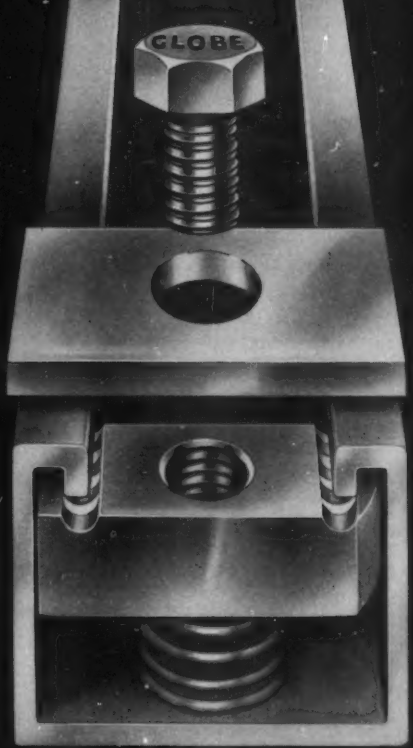

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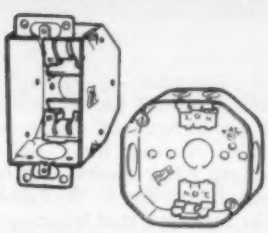
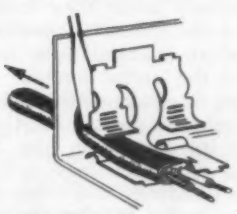


Available in switch boxes (including beveled corner boxes) and outlet boxes.



To remove cable, release clamp pressure with screwdriver.

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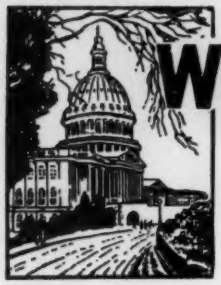

Washington report

By Jack James

Digest of Washington news of special significance to the electrical industry

Tax depreciation rules may get reform action

WITH UNEMPLOYMENT hitting around five million this month, reform of tax depreciation rules is receiving a boost.

Trade associations are arguing that more flexible depreciation rules would help take people off the unemployment lines and put them on the production lines.

The arguments go this way: When you buy equipment, jobs are provided for people making the equipment. In addition jobs are provided for the people who run the equipment. Right now tax rules don't allow businessmen to recover costs of some types of equipment in less than 30 years.

Suppose they could recover costs in three years. Then they would have more money to buy new equipment. This modernization would provide more jobs. It would help businessmen, their employees, and it would help this country fight recession.

Both President Kennedy and former Vice - President Nixon called for reform of depreciation tax rates during their political campaigns. After a survey of 6,000 business firms, the U. S. Treasury has just reported that businessmen want more flexible depreciation rules on buildings and equipment.

In the survey, businessmen told the Treasury what they think is wrong with present depreciation rules, what changes they would like, and the useful lives of various types of equipment they have.

It is almost certain that bills will be introduced in the next Congress to let businessmen depreciate buildings and equipment faster in order to provide more money to modernize business.

Labor Secretary stops IBEW missile boycott

SECRETARY OF LABOR Mitchell stopped a two-week secondary boycott by IBEW Local 756 and Plumbers Local 295 at Cape Canaveral, Fla.

At times as many as 300 building tradesmen joined in the walkout. Work stopped on the launching facilities for two giant space rockets, Saturn and Centaur.

The two unions claimed that their members who had constructed the blockhouses for firing consoles should be the ones to hook up the consoles to the missiles.

The National Aeronautics and Space Administration which directs the program had assigned its own technicians to make the hookups. NASA said that its employees customarily did research and development work.

Secretary Mitchell improvised an informal committee to recommend a permanent settlement of the dispute. While the committee is studying the dispute, the two unions have agreed to end their secondary boycott and let work resume.

Trial examiner of NLRB bans coercion by IBEW

HEAVY FINES by IBEW Local 861 to force a member of another IBEW Local to quit work for the Ace Electric Co., Lake Charles, La., have been found in violation of the Taft-Hartley Act.

A trial examiner for the National Labor Relations Board recommends that the Board order the Local to stop fining Wilmer J. Milam for every day that he works for Ace Electric.

According to the trial examiner, the Local wanted Milam to quit work so that one of its members could take the job. Milam had been referred by the Local to Ace Electric in March 1958, the trial examiner said. He was a member of a "foreign" local. A year later, when Local 861 members were out of work, the Local's business manager, Arneth Lard, asked Ace to discharge Milam.

Ace refused. The business manager ordered Milam to quit. Milam refused. "The Local thereafter tried Milam, found him guilty, and imposed so heavy a fine upon him for each day he continued to work, that the employee quit his job. . .", the trial examiner said.

"Shortly thereafter, it appears, arrangements were made between Milam and [Ace] whereby the former was given continuous work under subcontract, and he was employed in this fashion. . . "

Worker time lost equals eight production months

TIME LOST from work injuries during the last decade was the equivalent of closing all factories in the country down for one eight-month period, the National Safety Council reports. The amount of time lost: 2,750,000,000 man-days.

Secondary boycott power wanted by building trades

THE EXECUTIVE COUNCIL of the AFL-CIO Building and Construction Trades Department set a bill to permit secondary boycotts at construction sites as its number one legislative goal.

Thomas E. Shroyer, former counsel for the Senate Labor Committee, speaking in Washington, however, predicted that Congress would not pass such legislation. Shroyer said that the elections strengthened conservatives in Congress. Conservative Republicans combining with Southern Democrats will block any legislation to permit secondary boycotts, he said.

New construction to hit $57.3 billion in 1961

NEW CONSTRUCTION will hit a record $57.3 billion in 1961, the U. S. Department of Commerce predicts. This is $2.2 billion more than is estimated for 1960.

Almost all types of construction are expected to improve. A strong recovery from the 1960 slump is predicted for housing, and will come in the second half of 1961. In all, 1,350,000 housing units will be built in 1961, 50,000 more than the number estimated for 1960.

The Department of Commerce's optimistic prediction was echoed at the annual Business Outlook Conference sponsored by the Chamber of Commerce of the United States.

(Continued on page 104)

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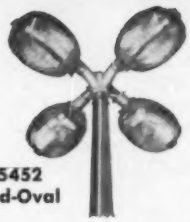

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GENERAL CATALOG — General catalog of Royal Electric Corporation, Pawtucket, R. I., covering flexible, service and lamp cords, cord sets, extensions, trouble lights, wiring devices and fuses is available to wholesalers. Dealers catalogs may be secured from Royal distributors.
Write in No. A101 on card, pg. 17

WIRING PRODUCTS — Various features of J&S Despard interchangeable wiring devices and detailed information concerning this line are offered in a brochure released by Pass & Seymour, Inc., Dept. ES, Syracuse 9, N. Y. Included are such features as Camstrap for quick, easy installation, three-wire grounding, and pressure terminal devices.
Write in No. A102 on card, pg. 17

FLUORESCENT BALLASTS—Advance Transformer Co., 2950 N. Western Ave., Chicago 18, Ill., has recently completed the compilation and printing of a 20-page catalog on fluorescent ballasts and their use. Included are data sheets on available advance ballasts and a comprehensive installation and operation section and testing procedures. Copies of the booklet are available on request.
Write in No. A103 on card, pg. 17

ELECTRICAL TAPES — Plymouth Rubber Co., Inc., Canton, Mass., is offering a new catalog on friction, rubber, and plastic tape. The full color folder gives descriptions, sizes, and packing information on their complete line of Slipknot electrical insulating tapes. Detailed specification data charts are included in the 6-page bulletin.
Write in No. A104 on card, pg. 17

UNDERFLOOR DUCT — Formerly known as Howarduct, the Spang Standard Underfloor Duct, is introduced by the Spang-Chalfant Division of the National Supply Co., Grant Bldg., Pittsburgh, Pa., in an eight-page, illustrated bulletin featuring its simplicity in the distribution systems for electric power, telephones, and inter-coms.
Write in No. A105 on card, pg. 17

ELECTRICAL BOXES—Steel City Electric Co., 1207 Columbus Ave., Pittsburgh 33, Pa., offers a catalog of their complete line.
Write in No. A106 on card, pg. 17

GUTH INDUSTRIAL LIGHTING BROCHURE — New 8 page, 4 color brochure by The Edwin F. Guth Company, 2615 Washington Blvd., St. Louis 3, Missouri, describes Guth KOLORKODED industrial lighting fixtures. This unique innovation of color coding luminaires opens a new field in industrial lighting. Folder includes photographs, lighting data, engineering information and complete descriptive data on KOLORKODED luminaires and standard RLM reflector units. Write for your free copy.
Write in No. A107 on card, pg. 17

SERVICE PANELS — Information on protective electric control centers for homes, apartment buildings, service stations, and industrial applications is contained in Bulletin PM-385, "BullDog Pushmatic Electric-Centers," issued by BullDog Electric Products Co., 7610 Jos Campau, Detroit, Mich.
Write in No. A108 on card, pg. 17

AERIAL CABLES — A 32-page booklet from Southern Electric Co., P. O. Box 989, Chattanooga, Tenn., explains how Compresto Cables and PLM Products, "Wrap Around" spacers can be combined in a compact spaced aerial cable system. Design, voltage drop, sag and tension, and short circuit current are also covered.
Write in No. A109 on card, pg. 17

FITTINGS AND FIXTURES—Information relative to explosion-proof fittings, fixtures, plugs and receptacles, and accessories is available in a 50-page book illustrating the complete line of these products manufactured by Killark Electric Mfg. Co., Easton and Vandeventer Ave., St. Louis 13, Mo.
Write in No. A110 on card, pg. 17

CONDUIT WIREHOLDERS — A new information sheet describing their line of all-purpose conduit wireholders is now available from Knox Porcelain Corp., P. O. Box 2031, Knoxville, Tenn. The illustrated sheet gives installation information, design features, and specifications.
Write in No. A111 on card, pg. 17

CONDUIT FITTINGS—A new 24-page catalog, illustrating a complete line of conduit fittings, oval bodies type LB, LL, LR, and T, and lighting parts is now available from Elliott Electric Mfg. Corp., 50-30 98th St., Corona, N. Y.
Write in No. A112 on card, pg. 17

SATURABLE REACTORS — This efficient method of regulating and controlling electric power for various manufacturing processes is described in a new folder available from Sorgel Electric Co., 838 West National Ave., Milwaukee 4, Wisc.
Write in No. A113 on card, pg. 17

POWER SWITCHES—A new bulletin describing its Type PV power switches, is now available from Line Material Industries, Milwaukee 1, Wis. The bulletin gives complete information on switches rated at 600 or 1200 amperes and having voltage ratings from 7.5 kv to 69 kv.
Write in No. A114 on card, pg. 17

MOTOR STARTERS—Design and construction features of their automatic reduced voltage starters are described in a new bulletin released by Allis Chalmers, Milwaukee 1, Wis. Included is motor control engineered for centrifugal compressors, hammer mills, pumps, large conveyers, large fans, motor-generator sets, and other applications.
Write in No. A115 on card, pg. 17

HEAVY-DUTY WIRING—Illustrations and detailed descriptions of 27 types of Circle industrial and commercial wiring products are featured in a four-page folder available from Circle Wire & Cable Corp., 5500 Maspeth Ave., Maspeth, N. Y.
Write in No. A116 on card, pg. 17

CONDUIT FITTINGS — A new catalog describing their line of conduit fittings is now available from L. E. Mason Co., Boston 35, Mass. The illustrated, looseleaf-type folder contains information on design features, specifications, ordering, prices, and shipping.
Write in No. A117 on card, pg. 17

We shoot for the moon every month!

The mean distance from the surface of the earth to the surface of the moon is 233,814 miles. Every month Southwire trucks come close to registering that many miles right here on good old terra firma. Our record so far was set at 229,893 miles in December 1959.

Like some others who are shooting for the moon, we haven't made it yet, but that doesn't keep us from trying. Someday soon we'll do it, and then we'll try for the round trip—467,628 miles!

Far-fetched? We think not. It points up Southwire's unwavering aim to produce more and better wire, and better service.

How does anyone reach the moon unless he shoots for it?

Southwire Company

SOUTHWIRE serves the world

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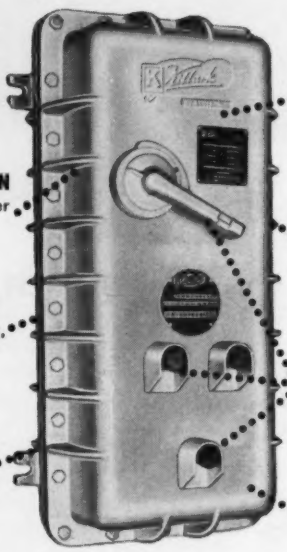
- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene, Polyethylene, and VWP* (Vinyl) Weatherproof Copper, Aluminum and Triplex
- U.R.C. (DBWP, TBWP) Copper
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Galvanized Steel Guy Strand and Static Wire
- Aluminized Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories
- NM Sheathed Cable
- ALSO FABRICATORS OF COPPER AND ALUMINUM FOR WIRE AND CABLE MANUFACTURERS

Killark control enclosures are best... BECAUSE THEY WERE DESIGNED IN THE FIELD

The Result of Field Tests . . . Plant Surveys . . . Consultation with Electricians, Electrical Engineers, Contractors

EXAMPLE:
An explosion-proof combination starter:



ALL-ALUMINUM
Lightweight, non-corrosible. Efficient thermal conductivity, non-magnetic.

RIBBED CONSTRUCTION
Maximum strength, faster heat dissipation.

RECTANGULAR SHAPE
Easier installation, better fit for components.

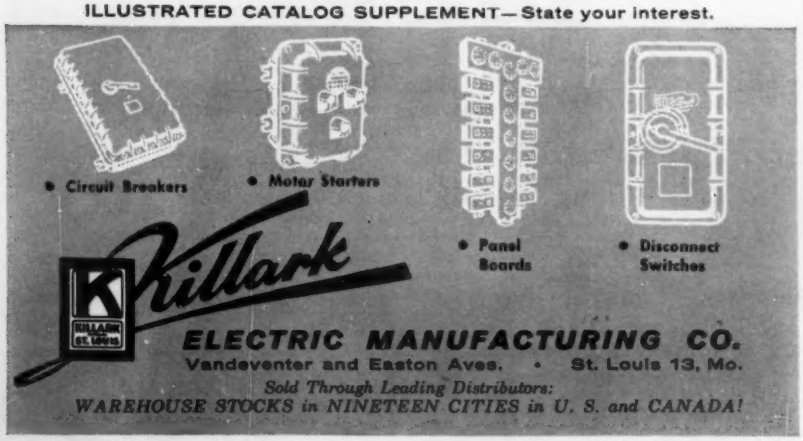
SPLIT-BOX DESIGN
Simpler wire pulling, easier accessibility.

FRONT OPERATION
Positive handle mechanism provides for 3 locks, safety guarded start-stop reset buttons.

GROUND SURFACES
Carefully machined for tighter fit. No stripped or galled threads.

HEAVY WALLS
Hubs of any size, located anywhere you want them.

ILLUSTRATED CATALOG SUPPLEMENT—State your interest.


• Circuit Breakers
• Motor Starters
• Panel Boards
• Disconnect Switches
Killark
ELECTRIC MANUFACTURING CO.
Vandeventer and Easton Aves. • St. Louis 13, Mo.
Sold Through Leading Distributors:
WAREHOUSE STOCKS in NINETEEN CITIES in U. S. and CANADA!

ELECTRICAL FITTINGS — A 40-page illustrated catalog and price list on the Gedney line. Shown and listed are conduit, threaded entrances, SEC, EMT and ground fittings and box connectors for both armored and non-metallic cables. Copies are available from Gedney Electric Co., RKO Bldg., Radio City, New York 20, N. Y.
Write in No. A118 on card, pg. 17

ELECTRICAL DUCTS — A brochure is now available from Johns Manville, 22 East 40th St., New York 16, N. Y., describing their line of Transite electrical ducts. The two-color, 11-page, illustrated bulletin contains information on composition, methods of manufacture, applications, costs, and installation. Also included are shipping weights and dimensions of Transite conduit and Korduct.
Write in No. A119 on card, pg. 17

STEEL WIRE—Technical information on Alumoweld, a newly developed aluminum-covered steel wire and strand, is contained in a 12-page catalog, just issued by the Wire and Cable Division of Copperweld Steel Co., 322 Frick Building Pittsburgh 19, Pa. Illustrated and documented with engineering data, the colorful catalog provides a complete working knowledge of this new material—its properties, advantages, applications and construction practices.
Write in No. A120 on card, pg. 17

PRESSURE CONTACT SWITCH—An 8-page folder (101-K) and a 4-page folder (200-EK) are available from the Kelek Company, 59 Davis Avenue, Norwood, Mass., describing their Kam-Lok Pressure Contact Switch, open and enclosed models, respectively, for high-capacity use with current-limiting fuses for 250 and 480 volt service entrance applications from 1200 to 6000 amperes.
Write in No. A121 on card, pg. 17

WIRE PULLING LUBRICANT — Illustrated six-page folder showing the advantages of an improved Y-Er Eas wire pulling lubricant is available from Electro Compound Co., 4145 W. 150th St., Cleveland 11, Ohio.
Write in No. A122 on card, pg. 17

SELECTING FUSES — A 12-page descriptive handbook, Fuseology, tells how to get safest, most dependable, trouble-free electrical protection from fuses. Contains useful information on selecting right size and type of fuses —how to stop needless blows—avoiding poor contact and other troubles. Issued by Bussmann Mfg. Co., University at Jefferson, St. Louis 7, Mo.
Write in No. A123 on card, pg. 17

*lighting's newest design elements from Noland

UNI-FRAME

*24 UNI-FRAME combinations fit every lens box application beautifully. Choose the size, lens, finish and splay trim for industrial, business, office or home installation. You'll have perfect lighting in perfectly good taste when you use Uni-Frame by Day-Brite, from your Noland Distributor.

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NOLAND COMPANY INC
INDUSTRIAL ELECTRICAL

WHOLESALE DISTRIBUTORS: PLUMBING HEATING
REFRIGERATION AIR CONDITIONING MACHINE TOOLS

CATALOGS and BULLETINS

Available Free To Readers of

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CLAMPS AND STRAPS — Some 600 clamps and straps are listed in a new catalog put out by Victor Specialties, Inc., 775 Main St., New Rochelle, N. Y. Catalog number, size, type, and price are listed for each item in numerical order under general categories. Illustrations are also included.

Write in No. A124 on card, pg. 17

ELECTRICAL FITTINGS — Blackhawk Industries, Dubuque, Iowa, offers a complete catalog of electrical conduit and cable fittings. Also a special publication giving detail drawings and instructions for installing service entrance masts on low or ranch type buildings.

Write in No. 125 on card, pg. 17

LIGHTING PANELBOARDS — A 4-page descriptive folder featuring a line of plug fuse and toggle switch panelboards for lighting control circuits is now available from Frank Adam Electric Co., 3650 Windsor Pl., St. Louis, Mo. The folder includes box sizes, details of construction, wiring gutters, special features, and catalog numbers.

Write in No. A126 on card, pg. 17

ELECTRICAL ENCLOSURES — Catalog Number 6061 currently being offered to the trade by B & C Metal Stamping Co., 590 Means St., N. W., Atlanta 18, Georgia, is a well organized compact 132 page manual. The Catalog is divided into two distinct sections, one covering products for the Utilities, and the other section covering products for the Electrical Contractor. This Catalog offers complete descriptive information, prices, and specifications on all items in the B & C line of Electrical Products and Devices. Copies are available free of charge to Distributors, Contractors, Architects and Engineers, and Utilities.

Write in No. A127 on card, pg. 17

DISTRIBUTION EQUIPMENT — Kuhlman Electric Co., P. O. Box 288, Birmingham, Mich., offers an eight-page catalog, CS-201, describing their line of distribution transformers of the single phase conventional type, 167 kva and below. Also available is an information sheet, CS-204, on the Kuhlman externally operated series-multiple switch for pole-type transformers 5-167 kva.

Write in No. A128 on card, pg. 17

CABLE CONNECTORS — Tomic Sales and Engineering Co., 20000 Sherwood Ave., Detroit 34, Mich., now have available catalog sheets containing data on the complete line of their connectors, couplings, and cable connectors.

Write in No. A129 on card, pg. 17

LAMP GUIDES—Sylvania Lighting Products, 60 Boston St., Salem, Mass., has made available three lamp guides containing general information, technical data, and catalog listings on their lines of fluorescent lamps, incandescent lamps, and mercury lamps.

Write in No. A130 on card, pg. 17

ELECTRICAL ENCLOSURES — Adjustable and non-adjustable floor boxes, watertight outlets for floor use, and conduit hangers are shown in the 20-page revised catalog #750 available from Fullman Mfg. Co., Latrobe, Pa. Adjacent to each photograph in the catalog are specifications for the product pictured.

Write in No. A131 on card, pg. 17

ELECTRICAL TAPES—Eight-page Accurate Tape bulletin details data on rubber, friction and plastic tapes. Bulletin features laboratory test results, includes complete packaging information. Immediately available from Accurate Manufacturing Company, Garfield, New Jersey.

Write in No. 132 on card, pg. 17

PLUG-IN REELITE — Complete details about Appleton's lightweight, portable automatic Reelites are given in an attractive 4-page catalog insert. These devices find application in a wide range of occupancies: garages, loading docks, garment industry, construction crews, warehouses, machine shops, etc. Write to Appleton Electric Co., 1701 Wellington Ave., Chicago 13, Ill.

Write in No. A133 on card, pg. 17

ATTENTION: Architects, Electrical Engineers, Contractors and Design Consultants

LIGHT UP THE "SKY"... WITH MODERNLITE DESIGNED BY STA-BRITE!

Yes, light up the "sky", light up the ceiling, light up the lives of thousands of happy women . . . include this revolutionary new fixture in your next housing project. It's helping more builders sell more homes right now as you read this! Modernlite is a low cost fluorescent unit, approved for FHA financing . . . a diffusion floater that gives more light for less wattage, and was designed to complement any decor — in homes or offices, even in elevators! Modernlite is only one of many new designs from Sta-Brite, so whether you're looking for lighting ideas, expert completion of a custom job, or a wide choice from stock — for any installation — let STA-BRITE light the way! CALL US SOON.

DESIGNERS ENGINEERS MANUFACTURERS

THE ULTIMATE IN LIGHTING FIXTURES

Whatever your requirements in lighting homes, offices and factories — depend on STA-BRITE'S quality fixtures and experienced engineering staff.

Write on your company letterhead for Sta-Brite's 1961 Price List.

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Help yourself to free literature and more details on any products mentioned in this issue.

Instead of writing a dozen different manufacturers for free literature and more information on products, equipment, or services, just insert on the cards below the appropriate key numbers of the items in which you are interested. These cards may be used to get information on products mentioned in the following departments (see Contents Page for page number):

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Be sure to print or write legibly your name and address—drop it in the nearest mail box and

ES pays the postage!

JANUARY, 1961

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City _____ **Zone** _____ **State** _____

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FIRST CLASS PERMIT NO. 582, SEC. 34.9, P. L. & R., ATLANTA, GA.

Electrical South
806 PEACHTREE ST., N. E.
ATLANTA 8, GEORGIA

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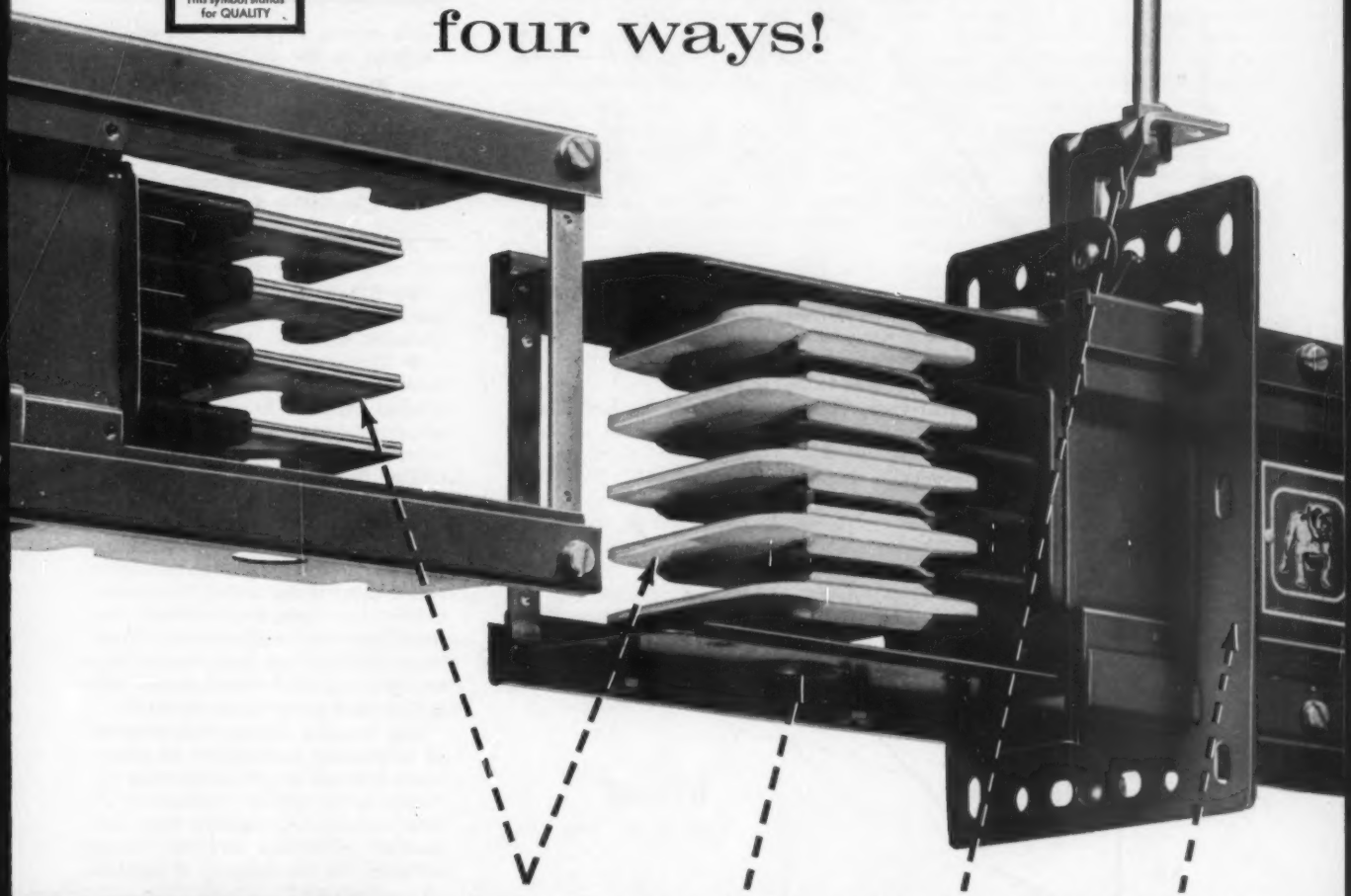
KNOW YOUR SYMBOLS

This symbol stands for bus duct

This symbol stands for QUALITY

XL Bus Duct by BullDog

Makes light work of installation four ways!

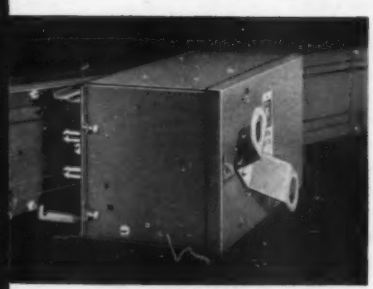


1 *Keyed ends* of plated aluminum bars align automatically, join as fast as sections can be handled.

2 *Single integral bolt* spins tight quickly to secure bars under a ton of pressure. Captive screws join casings together.

3 *New* HANGFAST® *Adapter* bolts to suspension rod fast ...duct with standard hanger is instantly hooked and secured.

4 *Lightweight*, rigidly-made 10-foot sections require only *half* as many hangers as ordinary duct.



PLUG-IN SAFETY—Self-supporting XL Safety Plug hooks to duct, leaving workman's hands free to complete electrical plug-in with utmost ease and safety.

BullDog, the creator of plug-in bus duct, has for years assisted industrial plant operations by providing high performance, efficiency, flexibility and dependability in power distribution. Then BullDog went one step further . . . developed XL BUStribution® Duct to make installation and handling easier than ever before, as shown above. At the same time, BullDog incorporated foolproof dead-front safety as well as other features ensuring that workmen plug in for power the safe way *only!*

Ask your BullDog representative to show you all these XL Duct installation and safety advantages. He can also provide complete information about BullDog BD plug-in duct, LO-X® plug-in duct and LO-X feeder duct.

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Mich. In Canada: 80 Clayson Rd., Toronto, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

Consult the following Southern representatives:

Wilson Electrical Equipment Co.
3210 Garrow St., P.O. Box 1725
Houston, Texas

Wilson Electrical Equipment Co.
101 E. Maple Street
San Antonio, Texas

Standard Electric Mfg. Company
2401 Federal St., P.O. Box 1138
Dallas 1, Texas

Walker Electrical Co., Inc.
125 Bennett St., N.W., P.O. Box 2308, Station D
Atlanta, Georgia

I-T-E CIRCUIT BREAKER COMPANY
BULLDOG ELECTRIC PRODUCTS DIVISION

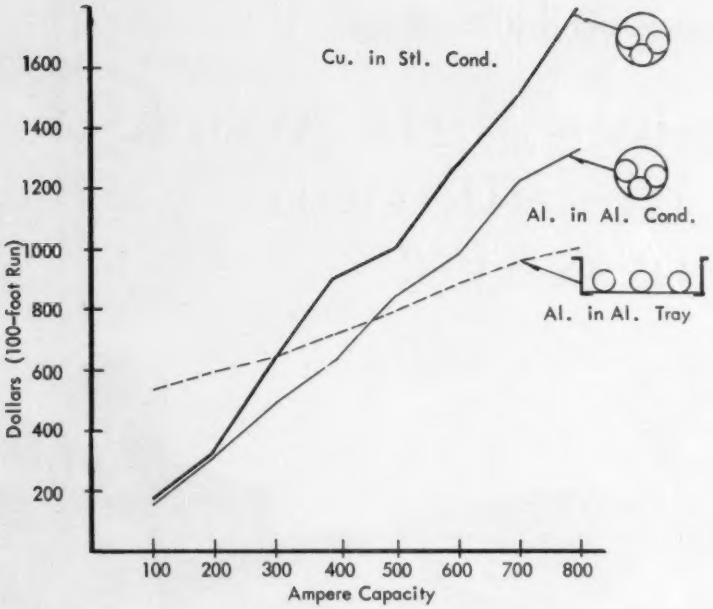


Fig. 1—Comparative costs of three types of industrial feeder system.

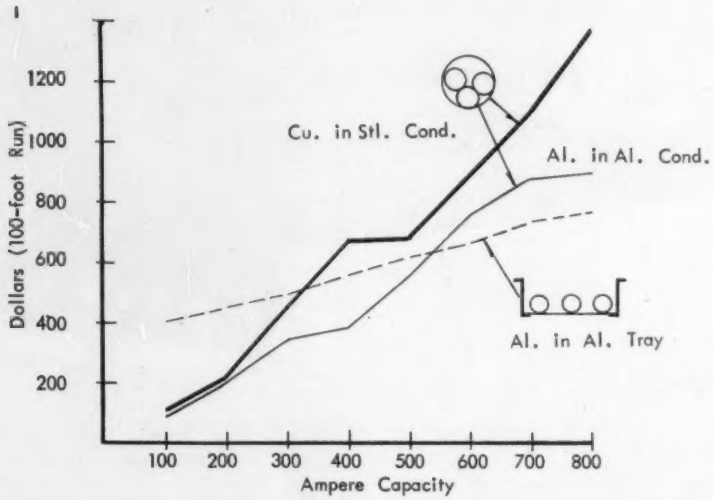


Fig. 2—Comparison of material costs only for three types of feeder.

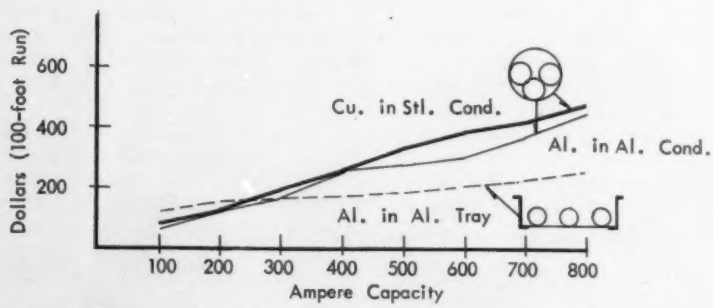


Fig. 3—Comparison of labor costs alone for the three types of feeder.

Comparison

This article should be especially helpful to the following readers:

- **Electrical Contractors**
- **Electric Utilities**
- **Electrical Wholesalers**
- **Electrical Inspectors**
- **Industrial Engineers**
- **Consulting Engineers**

By Elden G. Fox, Kaiser Aluminum and Chemical Sales, Inc., Newark, Ohio.

◆ The low cost and light weight advantages of aluminum have a special appeal to cost-conscious electrical engineers and contractors.

The development of new electrical design techniques—in conjunction with the continuing boom in new construction—have been major factors in establishing a trend toward the use of aluminum cables for industrial feeder systems. Almost simultaneously aluminum conduit has been made generally available throughout the nation at a price equal to steel.

The unique feeder combination of aluminum conductors in aluminum conduit is now competing directly with copper conductors in steel conduit. Aluminum trays are another electrical product being accepted for the support of insulated conductors.*

Following is a comparative cost study of an industrial feeder system which lends itself well to either conduit or open cable tray application.

The comparative figures illustrate the different feeder applications for loads 100 through 800 amperes. All material and labor prices are included. The supporting hangers and rods were not considered in the cost comparison because each of the compared feeder systems will require the same identical support. The combined

*** Editor's note: Although this tray method is being used to some extent, it does not have Code approval. Such trays can be used for support of standard cable assemblies without violation of the Code.**

# of industrial electric feeder costs

advantages of an all-aluminum system over copper and steel are easily seen from the chart data shown in Figures 1 through 6.

There is nothing secretive about the fact that all-aluminum systems are more economical—aluminum conductor simply costs less than its equivalent copper conductor. This is the first in a series of steps toward dollar savings. By an additional savings of labor when installing supports for these conductors, we come up with a reliable, safe, and most economical electrical feeder system.

Figure 1 illustrates the comparison of material and labor costs for capacities of 100 through 800 amperes. Aluminum conductors cost less for all capacities, but, for best economical results, should be carefully designed into the proper conductor supports. It can be seen that the aluminum's light weight and low cost characteristics carry over into the supporting members of the feeder system.

There are types of installations where nothing except conduit can be used for carrying conductors and, likewise, there is also a place for aluminum tray applications. Industrial installations are especially good spots for either conduit or trays. The cost of such installations depends upon the ampere capacity desired.

From Figure 1 it can be seen that ampere ratings below 500 are lowest in cost, when considering both material and labor, for aluminum conductors in aluminum conduit.

Now, if the needed capacity is 500 amperes or above in a case where tray application is allowed, consideration of aluminum conductors in aluminum tray will pay. Figure 1 also shows that, under this condition, total costs will be most economical.

It is up to the designer of a particular installation to decide which conductor carrying method will serve to the greatest advantage. We cannot say the same about the conductors, as aluminum costs less and can be used in any or all applications for electrical feeders. Therefore, based on economical reasons, aluminum conductor is the automatic choice.

Aluminum conductor ampere capacity is less than copper conductor ratings for the same physical size. When considering tray versus conduit applications, an advantage exists which ups the current capacity of conductors in tray to open air ratings.

In terms of ampere capacity requirements, an all-aluminum system, aluminum cable in aluminum tray is better than conductors in conduit. Figure 4 plainly indicates this advantage.

Aluminum conduit's non-magnetic effect on conductors within will cause lower inductive reactance on a-c circuits, resulting in less voltage drop along feeder runs. Since the maximum allowable voltage drop is a deciding factor in sizing wire, this non-magnetic effect should be considered.

The conduit size is derived from the size of conductors within, therefore, it is an important economic fact to keep wire sizes below the overdesign stage.

Conductors in tray fall into a different position as far as voltage drop is concerned. In the first place, the open air ampere rating allows smaller wire sizes for each

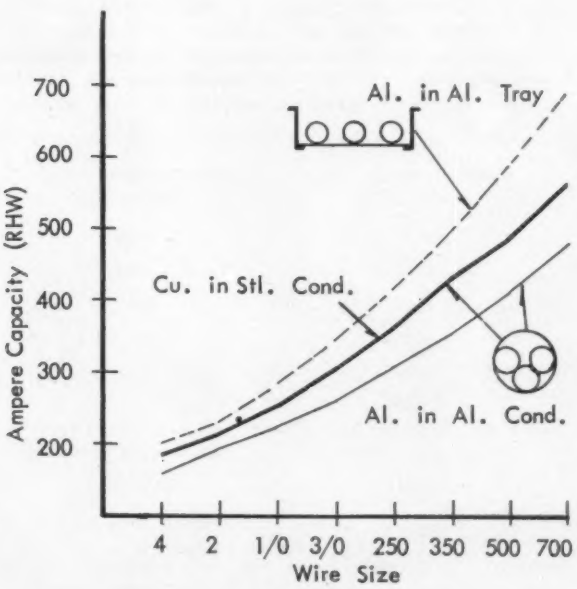


Fig. 4—Relative ampere capacity for various wire sizes.

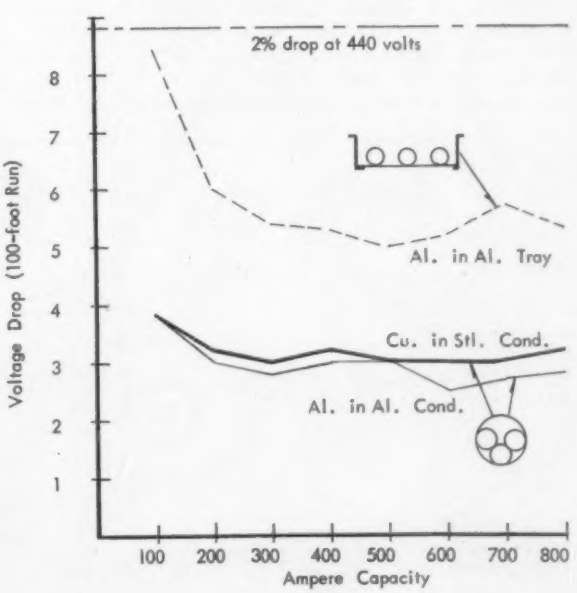


Fig. 5—Voltage drop per 100-ft run vs ampere capacity.

feeder comparison. Where the wire size is smaller, the resistance is greater, thereby creating a higher voltage drop per ampere capacity. Second, the conductor size, when installed in trays, can be varied without any appreciable cost difference. If voltage drop is excessive on long runs, a wire size larger can be used without causing an increase in tray sizes, in most cases.

In Figure 5, the chart indicates voltage drop for each type of feeder based on 100-foot runs. All feeders considered have a maximum voltage drop not exceeding two per cent of 440 volts, which is a standard industrial utilization voltage. For a run of 100 feet or less, the feeders shown would do the job satisfactorily, but for runs greater than 100 feet it may be

(Continued on page 103)

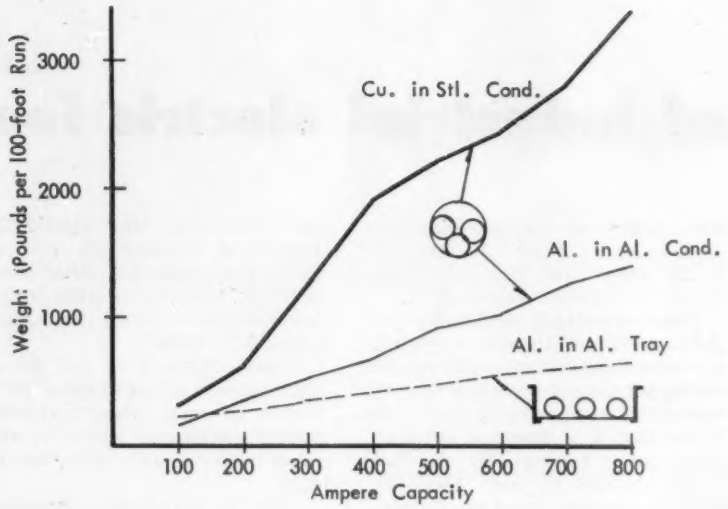
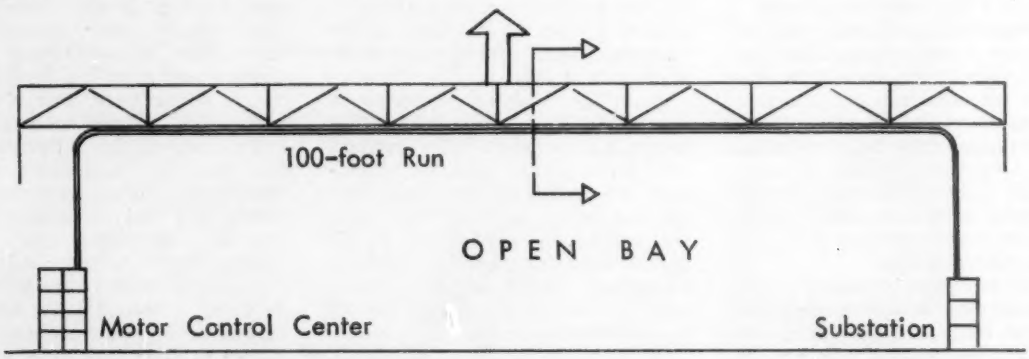


Fig. 6—Comparison of cable and conduit weight versus ampere capacity.



Typical industrial feeder installation comparison

For this typical industrial feeder installation, the load is assumed to be 800 amperes at 440 volts, three-wire, three-phase. The run is assumed to be 100 feet long, and the maximum allowable voltage drop is two per cent. The tabulation shows detailed cost comparison for three types of construction: copper in steel conduit, aluminum in aluminum conduit, and aluminum in aluminum tray. The costs include labor and materials for the conductors and the conduit or tray. The supports are not included as they would be about the same for all three methods.

	Copper in steel cond.	Alum. in alum. cond.	Alum. in alum. tray
Wire size	2-600 MCM	3-400 MCM	2-400 MCM
Conduit or tray size	2-3½"	3-3"	16" width
Wire cost	$978	$482	$322
Conduit or tray cost	$372	$421	$445
Wire labor	$185	$215	$145
Conduit or tray labor	$275	$220	$100
Total cost	$1,810	$1,338 26% savings over cu. in steel conduit	$1,012 44% savings over cu. in steel conduit
Wire weight	1,494 lbs.	598 lbs.	399 lbs.
Conduit or tray weight	1,876 lbs.	804 lbs.	250 lbs.
Total weight	3,374 lbs.	1,402 lbs. 58% savings over cu. in steel conduit	649 lbs. 80% savings over cu. in steel conduit

Six contractors organize association

First project involves establishment of 'labor pool' for exchanging manpower

Louis F. Mellott organized the electrical contractors' association.

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers ✓

By Louis Mellott, President, Mellott Electrical Co., Arlington, Va.

◆ The establishment of a "labor pool" from which manpower could be exchanged on a temporary or permanent basis was a first step in the program of the newly organized Northern Virginia Electrical Contractors Association.

Compiling a register of available labor listing name, age, experience, and rate of pay, the association provides contractors with labor on a temporary or permanent assignment at the prevailing rate of pay.

The Northern Virginia Electrical Contractors Association was begun in January of this year, when I extended an invitation to six of the electrical contractors, who were normally doing the major portion of the commercial construction in the northern Virginia area, to attend a meeting in my office to see if there were ways in which we could improve our position in the construction industry.

Out of this and subsequent meetings the Northern Virginia Electrical Contractors Association was organized.

These six electrical contractors represent a very minute segment of the construction industry, yet their impact has been one of the most gratifying things that I have seen in the industry for the ten years that I have been in business.

Our first project, forming a "labor pool" from which manpower could be exchanged on a temporary or permanent basis, works as follows:

If a contractor wishes to place a man for temporary or permanent assignment, his name is placed on a register from which other members of the association can draw. Vital statistics on this man include name, age, experience, and rate of pay.

If this man is picked up by another member of the association for temporary assignment, he is paid at his prevailing rate and used until re-called; if he is picked up on permanent assignment, this information is used to evaluate him for re-assignment.

Depository system

Our second, and most important, project to date was the establishment of a bid depository system.

The bid depository system was not original with us, but it was a pilot installation in this area.

Basically, the depository works as follows:

At least four hours prior to the time of bid opening, we register our quotations, in writing, with an independent agent. We then call our quotations out to the general contractors as early as practical, (preferably four hours prior to bid opening). It is to be especially noted that a subcontractor may quote any given price to any given contractor—they need not be the same quote.

Also, a subcontractor may not alter his quote in any way after it is registered with the depository agent; he may, however, withdraw his bid.

The day following the bid opening, the depository agent will open the electrical quotations and issue a resume of electrical quotations to the apparent low bidding general contractor.

The electrical contractor who is shown to be low by this resume is then free to negotiate with the general contractor in any manner he may see fit to secure a contract. All other members will assume a hands-off attitude and can only accept a contract at their original quoted price.

Bid cutting discouraged

The policy of bid cutting is discouraged under any circumstances unless job conditions are altered to change the cost of work involved.

Before the bid depository system was put in operation, we sent all of the general contractors and suppliers affected an open letter stating our avowed purpose, "to improve the general bidding procedures of the construction industry in general, and to inject an orderly and ethical procedure whereby bids may be submitted and contracts awarded."

A complete copy of the depository agreement was also included.

Response pleasing

The response received has exceeded our fondest expectations. It has been warmly received by general contractor and supplier alike.

The suppliers were assured that they would receive ethical treatment in response for their co-

(Continued on page 102)

Apprentice program brings benefits

Training young personnel to meet company criteria makes possible uniformly high standards on every job

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers
- Consulting Engineers

By Bryant G. Harris, President and Treasurer, Harris Electric Co., Inc., Washington, D. C.

◆ A good apprenticeship program brings vast benefits to a company. Training its young personnel in the type of quality workmanship and ethical customer dealings for which the company is reputed makes possible a uniformly high standard on every job.

The stamp of a company's integrity becomes a recognizable earmark in the trade. Mechanics reared in the company's approach and procedures have a high morale. They work better as a unit; they are closer to each other and more cooperative. An apprenticeship training program promotes labor stability.

We have trained 90 per cent of the mechanical personnel now employed by us. Fifteen of our journeymen and one master electrician have successfully completed our apprenticeship training program, and 13 apprentices are now in training. The earnest, conscientious apprentice with maturing skill who remains with the company may look forward to paid vacations, paid holidays, and an annual bonus based on the net profit of the corporation.

Concern for individual

During his four years of apprenticeship there is a company concern for him as a functioning individual: his personal, family, housing, or financial problems may be brought to the serious attention of management for assistance and solution.

For it is our earnest belief that a company can realize labor's maximum potential only through respect for the individual, patience and tolerance in training him, and rewarding him appreciatively for his effort, loyalty, and achievement. We have deep respect for the apprentice striving to be an electrician. He is generally a man of higher mental ability, a man whose interest in the theories and laws of electricity might have led him to electrical engineering, had he been given the opportunity.

Our apprenticeship training program combines on-the-job training with classes in theory of electricity, study of the Code, and ethics or relations with the public. While we are registered with the District of Columbia Apprenticeship Council, we do not insist that our apprentices be registered with them.

Drawn from the vocational schools, the Apprenticeship Council, the District Department of Occupations and Professions to which they may have applied for licenses, and through fellow employees in the company, prospective apprentices first fill out an application form with us and are then painstakingly interviewed.

While we note education (a high school diploma is preferred, though not an absolute requirement), age (between 20 and 35), any experience (references are checked for type of person, why employ was left, etc.), single or family man with responsibility, we try to gain an insight into the mechanical interests and aptitudes of this inexperienced youngster by talking to him at some length.

Did he ever tinker with a car of his own? Ever build a radio? Did he ever take a toaster apart and try to repair it? Or a lamp or electric iron when it didn't work? How did he like his course in physics in high school, the sections on electricity and applied mechanics? How did he do in them? Does he remember Ohm's Law? His responses are significant.

When I feel that I have promising material, I take a prospective apprentice around with me on estimates, on job inspections at houses and buildings, giving him a sketchy explanation of what is taking place. I note his expression, his questions, his attentive interest in my answers or explanation. This is a most telling index as to how well he will use his opportunity as an apprentice.

Wages determined individually

Rate of hourly wage is determined in each case on an individual basis. While the D. C. Apprenticeship Council starts a green apprentice at $1 an hour, we look into individual circumstances and have paid as high as $1.65 for a starting mechanic.

A man with family responsibilities, with a background of schooling, some experience, and evidence of serious interest will command a higher rate than a green beginner, a single youngster who will be entirely dependent on his supervising mechanic to initiate him into the trade.

The company's need for an apprentice at the moment plays some role, too, in determining what his hourly rate of pay will be. If we are in dire need of help, and an apprentice has demonstrated that he will be of immediate value, he may start at $1.35 or $1.50 an hour.

Rate of advance depends on a mechanic's ability. A willing, dedicated apprentice, fast-learning, receives an hourly wage increase before the six-month increase of 12½ cents set down by the D. C. Apprenticeship Council. An alert apprentice with high

(Continued on page 101)

Bryant G. Harris, right, president and treasurer of Harris Electric Co., Inc., Washington, D. C., is explaining the operation of a high voltage cut-out, which will be installed in switchgear, to some of his apprentices. Mr. Harris is a registered electrical engineer.

An apprentice is shown how to strip armor from cable, during installation of bowling alley foul indicators.

Two of the Harris Electric Company apprentices are making preparations to install some 2½-inch conduit from a transformer to switchgear.

Bill Mosby, job foreman and former apprentice, is preparing to connect a 5,000-volt switch to the circuit, in installation of a 225-kva transformer at Howard University, Washington.

Against a background of lighting fixtures three leaders of the Atlanta Electrical League meet to talk: from left to right, president, Cyrus M. Wallace, Jr., Georgia Power Co.; executive director, Hal M. Horton; chairman of the board of directors, Johnnie E. Sweatte, Georgia Power.

Permanent

This article should be especially helpful to the following readers:

- Electrical Contractors
- Electric Utilities
- Electrical Wholesalers
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

◆ An electrical equipment exhibit area of 20,000 square feet—in reality a full-dimensional catalog for architects, engineers, and contractors—is one of the many services recently made possible through the forward-looking program of the new Atlanta Electrical League.

The exhibit is proving to be of very practical help to local electrical wholesalers, electrical contractors, builders, and others in getting the most suitable lighting fixtures and other electrical equipment specified for their important jobs.

Left to right, are Hamilton Corey, Graybar Electric; Oren M. Ruff, Jr., Oren M. Ruff, Jr., and Associates; Cecil Cannon, IES Southeastern regional vice-president, Day-Brite Lighting, Inc.; J. D. Wade, Walker Electric Co.; and E. D. Johnson, Whitman Associates. Mr. Corey is vice-president of the Atlanta Electrical League and Mr. Ruff, Mr. Wade, and Mr. Johnson serve on the board of directors. The local section of the IES was largely responsible for initiating and organizing the league, in cooperation with allied electrical industries.

exhibit sponsored by electrical league

The league rents the entire second floor of the Architects and Engineers Institute Building at 230 Spring Street N. W., in downtown Atlanta. The display area, known as the Electrical Center and open to the public, features the products of 132 manufacturers of electric equipment and appliances, including an extensive display of lighting fixtures.

The league was organized by a group of men representing the various branches of the electrical industry in the service area of Georgia Power Co., who met to discuss the possibility of establishing in Atlanta a lighting institute similar to the Chicago Lighting Institute.

However investigation indicated that the electrical industry of Atlanta and Georgia would be better served if the exhibits and promotional activities embraced other branches of the industry, such as heating, air-conditioning, controls, and communications.

Subsequently a meeting of representatives from all branches of the electrical industry was held, and the Atlanta Electrical League, Inc., came into being.

"We want to bring to all of the public the fact that there are many commodities produced by the electrical industry with which they may not be familiar. Here we have all the major manufacturers of electrical equipment displaying their products.

"The public may come here at any time to determine what these products are, examine their appearance and specifications, and decide what they want to use, whether it be for application in residential, industrial, or commercial structures." Thus Hal M. Horton, executive director and secretary-treasurer of the league, summarized the aims of the organization.

Mr. Horton, a full-time staff employee of the league, was associated for over 33 years with the General Electric Large Lamp Division.

"Man is a creator of his environment, and what he builds is a measure of what he is," continued Mr. Horton, explaining why promotion of the display area will be increased to bring in more and more of the public to see available products.

Publicity planned

"One of our next ventures will be to publicize the league through magazines, newspapers, and talks. We are going to invite organizations such as garden clubs, PTA's, and similar groups to have their meetings here and at the same time view the exhibits," continued Mr. Horton.

On the same floor as the display area are the Reddy Kilowatt Lounge and the IES Hall for meetings, banquets, and various other social and business affairs. The lounge is furnished in contemporary furniture, and both it and the IES Hall are available to exhibitors for commercial, sales, and

(Continued on page 101)

Left to right, are Mr. Wallace; L. Ralph Bush, Bush-May and Associates; Mr. Horton; Mr. Sweatte; Roy S. Chappelle, executive director of the Architects and Engineers Institute, in whose building the league is headquartered; and J. J. Burns, chairman of the Georgia Section of the IES. Mr. Bush is also a director of the league. The league was organized by a group of men representing the various branches of the electrical industry in the service area of Georgia Power Co. An extensive publicity campaign has been planned.

SEE annual sales section conference

Primary competition for electric utilities in decade ahead to come from government, states Exchange President MacInnes

◆ "Our main competition in the decade ahead will come from three sources—from government (Federal, state, and local); from competitive fuels; and, strange as this may seem, from ourselves."

This statement was made by W. C. MacInnes, president of Tampa Electric Company and the Southeastern Electric Exchange, at a luncheon address at the Sales, Advertising, and Public Relations Conference of the Southeastern Electric Exchange held in Atlanta, November 16-18, 1960.

The meeting, attended by over 300 utility executives from Southeastern Electric Exchange companies, emphasized residential, industrial, commercial, and farm power sales, as well as advertising.

Mr. MacInnes continued, "In the decade to come, government will surely be the number one competitive factor in our industry. This problem of government competition is first a nationwide problem, with the Federal government already producing electric power in 28 and selling this power in 31 of our 50 states. . . ."

Second area: fuels

He further stated, "Our second greatest area of competition in the decade ahead will, of course, come from competitive fuels—primarily natural gas. . . . We are also on the right track with the industry-wide promotion of the total electric living concept. At long last, we are beginning to realize the truth of an old advertising adage that people do not buy things; they buy benefits. . . .

"A good many of our forward thinking companies are already offering a number of services, such as special rates for electric heating; budget billing; rental arrangements on individual yard and street lights; and company-owned, full Housepower, service entrances. You that are offering these innovations are to be commended. More of us are going to have to resort to similar services if we are to meet our competition on equal ground. . . .

Third area: ourselves

"Our third main area of competition in the decade ahead is ourselves. . . . All of you will agree that it is a difficult task to sell a customer on going total electric if she has had an unhappy experience with an electric appliance. None of us has ever considered, I am sure, that it is anyone's job except ours to make sure that our customers are satisfied customers. In order for us to keep them satisfied with the cost of their electric service, we are going to have to quit advertising the idea that electric service is cheap.

"We can no longer dwell on themes such as 'one cent sales on electricity.' We must sell *advantages* and point out to our customers just how many of these advantages they are getting in return for money spent for their electric service. . . .

"In meeting the competition from other fuels, and from ourselves, we must never lose sight of the fact that *service* is the very foundation of our business. And, in selling our service and its advantages, we must not become too concerned with whose service is 'cheapest'."

Other speakers also emphasized the sale of electricity, through talks, slides, and question-and-answer periods.

Residential market

A report on "The Growing Importance of the Residential Market" was presented at the conference by E. A. Wilson, vice-president, Alabama Power Co.

Mr. Wilson stated, "To be sure, population growth, the increase in housing, the development of new products, all have aided in the increase in total residential sales. But there is no escaping the fact that if kwhr use per customer is to triple in the next 20 years, our customers are just going to have to use a lot more of the electrical devices that are already available.

"In other words, we're going to have to knuckle down, double, redouble, and keep redoubling our already aggressive sales efforts. . . .

"There is the decided trend to the construction of quality homes at all price levels. Even the modest home which in former years was not much more than four walls with sufficient partitions to provide five or six rooms is today being built to better standards of design for better living. . . .

Magazines contribute

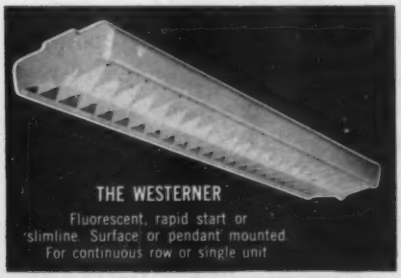
"The shelter magazines have made, and continue to make, a very important contribution to the concept of better utilization of space, higher quality, and more attention to equipment of the home. We in the electric industry have been most fortunate in the support which the shelter magazines have given to many uses of electric service for better lighting, for outdoor living, cooking, laundry, heating, and air conditioning. . . .

"We're going to have to work more closely with our dealers, our wiring contractors, home builders, electrical inspectors—those 'silent' partners of ours on whom we depend so heavily to sell the electrical story at the 'grass roots' level. . . . We're going to have to work in closer harmony with the manufacturers and distributors of electrical appliances and equipment. We've come a long way in recent years in this particular respect—but we've still a long way to go. . . .

"We must study our own operating procedures to be sure that all of our company policies, all of our contacts with the public . . .

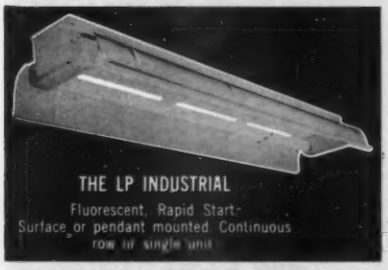
"LIGHT-UP" with L & P Lighting

THE PEABODY
For continuous row or single unit installation—fluorescent, rapid start or slimline.

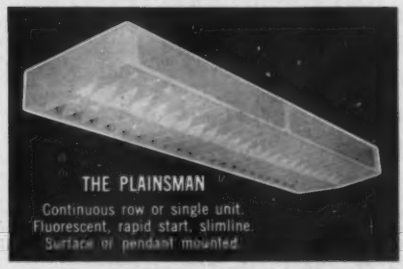


THE WESTERNER
Fluorescent, rapid start or slimline. Surface or pendant mounted. For continuous row or single unit.

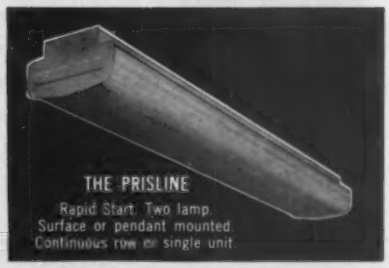
THE EXPLORER
Enclosed commercial, 2 and 4-lamp, surface or pendant mounted.



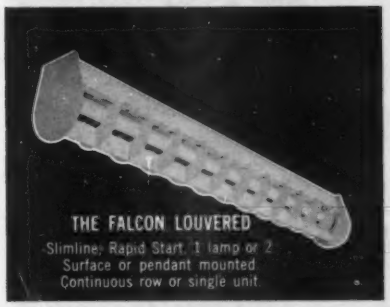
THE LP INDUSTRIAL
Fluorescent, Rapid Start. Surface or pendant mounted. Continuous row or single unit.



THE PLAINSMAN
Continuous row or single unit. Fluorescent, rapid start, slimline. Surface or pendant mounted.



THE PRISLINE
Rapid Start. Two lamp. Surface or pendant mounted. Continuous row or single unit.



THE FALCON LOUVERED
Slimline, Rapid Start. 1 lamp or 2. Surface or pendant mounted. Continuous row or single unit.

PENDANT MOUNTED UP-DOWN LITE
Heavy gauge aluminum. Perforated. Non-twist stem, hang straight aligner.

SURFACE OR SEMI-RECESSED SQUARE
Vandal-proof, Tamper-proof, Weather-Resistant.

CONCENTRIC RINGS
Seamlessly butt welded steel. Heavy gauge aluminum canopy. Aluminum non-reflecting baffle.

DOME LITE
Heavy gauge spun aluminum. Available pendant, surface or recessed.

BRACKET LITE
Cast aluminum. Moisture and vapor resistant. White opal globe.

Here are only a few of the quality fixtures in L & P's complete line of fluorescents and incandescents—everything from open and enclosed commercials, industrials and strips, corridor lights and troffers, to illuminated ceilings, concentric rings, bracket and dome lights, rounds and squares. For beauty, efficiency and economy, order L & P fixtures.

For complete catalog and price lists, write

L&P LIGHTING
Olive Branch, Mississippi

No. 2--A Partner in Business

JIM HISSERICH, L & P representative in the St. Louis area, knows the electrical industry thoroughly. He should — after spending 11 years at it, including nine years directly connected with the lighting business . . . with an electrical distributor, a manufacturer, and now as manufacturer's agent.

J. F. Hisserich

A native of St. Louis, he also designs lighting equipment. In spare time, he's a professional pilot and flight instructor, and is keen about fishing, hunting and water skiing. Jim is also keen about L & P "service after the sale" and works mighty hard to keep his customers not only satisfied, but absolutely delighted with L & P.

"Having been in the distributor game myself," Jim says, "I am especially sympathetic with their problems. That's one reason I am so enthusiastic about the trend toward 'selective distribution'. I don't blame the good distributor for getting sick and tired of spending days and days of his time working out a lighting installation with an electrical contractor — only to have that contractor peddle it all over the place, beating down prices and giving the job to whoever cuts the price most.

"I see a trend toward more selection of both distributors and contractors. The good distributor increasingly is looking for contractors with loyalty, contractors who appreciate extra service, and don't take advantage of it. It just doesn't make sense to expect one fellow to give the service — and the other fellow to get the sale because his price is lower. ANYONE's price could be lower, if he cut out service altogether.

"But it's real, honest, experienced service that has built and maintained our business. Like all L & P agents, I'm going to do everything I can to help the good distributor, and to assist him in every way to continue the 'service after the sale' that is an L & P tradition."

L & P LIGHTING

Olive Branch, Miss.

1035 Firestone Blvd. Memphis, Tenn.

Distributed by Wholesale Dealers Only

There's an

L&P

Representative Near YOU!

For further information and prices on L & P fluorescent fixtures—standard or "custom-made"—check the following list, and phone or write the L & P representative nearest you:

(F—Fluorescent)
(I—Incandescent)

Associated Manufacturers Agents (F)
900 Carondelet St.
New Orleans, Louisiana

James E. Clary (F - I)
62 Flicker
Memphis, Tennessee

Craig-Owen (F - I)
306 E. 11th St.
Chattanooga, Tennessee

C. V. Hammon (F - I)
845 S. W. 52nd St.
Oklahoma City, Oklahoma

J. F. Hisserich (F - I)
2001 Big Bend Ave.
St. Louis, Missouri

Howard E. Johnson (F - I)
2976 Randy Lane
Dallas, Texas

Allan M. Kahoe (I)
8849 25th St.
Metairie, Louisiana

Richard B. Murdoch (F - I)
7300 Bailor Ave.
College Park, Maryland

William B. Murray (F - I)
531 Western Ave., N.W.
Atlanta 14, Georgia

N. B. Nichols (F - I)
2509 Bishop
Little Rock, Arkansas

Joe E. Pearce & Associates (F - I)
50 N. Kenmore
Indianapolis, Indiana

Gerald Preacher (F - I)
116 N. Church St.
Lexington, South Carolina

Irvin Spero (F)
4142 Stillmore Rd.
South Euclid, Ohio

Arthur H. Swartz (F - I)
2120 Polk Ave.
Houston, Texas

Light & Power Utilities Corp. (F-I)
P. O. Box 157
Olive Branch, Mississippi

give every reasonable consideration to the needs of those who pay our salaries."

Employees on sales team

"All Employees Are on Our Sales Team—How We Do It" was discussed by W. M. Shepherd, vice-president in charge of sales, Arkansas Power and Light Co.

"You have heard it said that sales activities must have management's support to be successful, but I say to you that getting every employee on the sales team demands *management's leadership*, which is a great deal more than management's support.

"This means starting at the very top of the company, and it cannot start any lower and be successful. The chairman of the board or the president, whoever is active top management, must talk sales consistently. . . .

"In our own company we have what is known as the Ritchie Report, named after the chairman of the board, which is a monthly tabulation on each new house constructed on our properties and whether electric or competitive equipment was installed. . . .

"This idea of sales participation must be sold, and it must be sold to all employees. It must be recognized at the outset that this will take time because it involves changing people's attitudes, changing their habits, and changing their thinking about company operations. . . . In our own case, we have been working at it about nine years. . . .

"*We do not pay for prospects* and while I have had many arguments with my friends around the country, we are convinced that this is a fundamental. We ask an employee to comb his hair, dress neatly, be courteous, live and work safely, and be loyal to his company. Why shouldn't we ask him to *sell* a little?

"You see, we are not asking a person to work overtime or spend hours at this task. In our company we ask for two prospect cards a month for ten months out of the year. So you can see all he really has to do is to keep his ears open when he goes to church, Sunday School, lodge meeting, or even out on the job where he contacts and talks to people. . . .

"This year we have converted our general office sales organization to a functional group, and this has allowed us to place the responsibility for supervision and performance of sales activities at field level. . . .

"We print an annual sales program, and we begin in August of each year to ask salesmen and operating people as well as distributors to make suggestions for the following year's program. . . .

"We furnish a small holder which fits on the dash of an automobile as a container for prospect cards, and we issue to employees a pocket folder which holds several prospect cards and has a message about getting prospects."

Mandate, opportunity

Laurance C. Messick, director of the National Medallion Home Program, gave an address entitled, "A Mandate and an Opportunity."

Mr. Messick stated, "It's going to be largely up to men such as yourself, and to the companies which you represent, whether . . . consumers expend their extra money wholly for the gratification of their leisure pursuits—a larger boat, membership in a country club, additional photographic equipment, a swimming pool in their back yard, each of them a rapidly depreciable item — or whether they are going to invest it solidly in a total electric Gold Medallion Home.

"It's going to be up to you if they are to be influenced to modernize their existing home to the level of Medallion standards; or whether they are going to sell that home and buy a shining, new, thoroughly modern, total electric Gold Medallion Home; in either instance, in the light of the experience of the past decade, the value of their thoroughly modern, total electric Gold Medallion Home can be expected to appreciate, while items purchased in gratification of their leisure pursuits will be only a continuing expense, as well as depreciating rapidly in value. . . .

"During the first nine months of 1960, while private, non-farm housing starts dropped 19.2 per cent below those for the same period of 1959, shipments of both types of Medallions rose 19.2 per cent. . . .

"During the first nine months of 1960, while private, non-farm housing starts dropped 19.2 per cent below those for the same period of 1959, shipments of both rose 19.2 per cent. . . .

"During the same period, 297 more utilities applied for authorization to carry on Medallion Home Programs in their service areas, boosting the total to 656. Included are 172 commercial companies, 162 municipally owned utilities, and 322 cooperatives, located in 49 states and the District of Columbia.

"Of this group, it is interesting to note that eight per cent have Bronze Medallion authorization only, 30 per cent have Gold Medallion authorization only, and 62 per cent have authorization to certify both Bronze and Gold Medallion Homes. . . .

"I called the Edison Electric Institute and learned that the average residential customer is considered to be using 3,600 kwhr per year at a 2½¢ rate. This multiplies out to a $90 annual billing.

"Last month I was privileged to read a preliminary analysis of a questionnaire sent out by Ebasco to the companies it serves, regarding their respective Medallion Home operations. These companies reported their estimated annual revenue for Bronze Medallion Homes as being anywhere from $135 to $215 each, with an average of $179. Their reports of estimated annual revenue per Gold Medallion Home ranged from $335 to $450, and averaged $391.

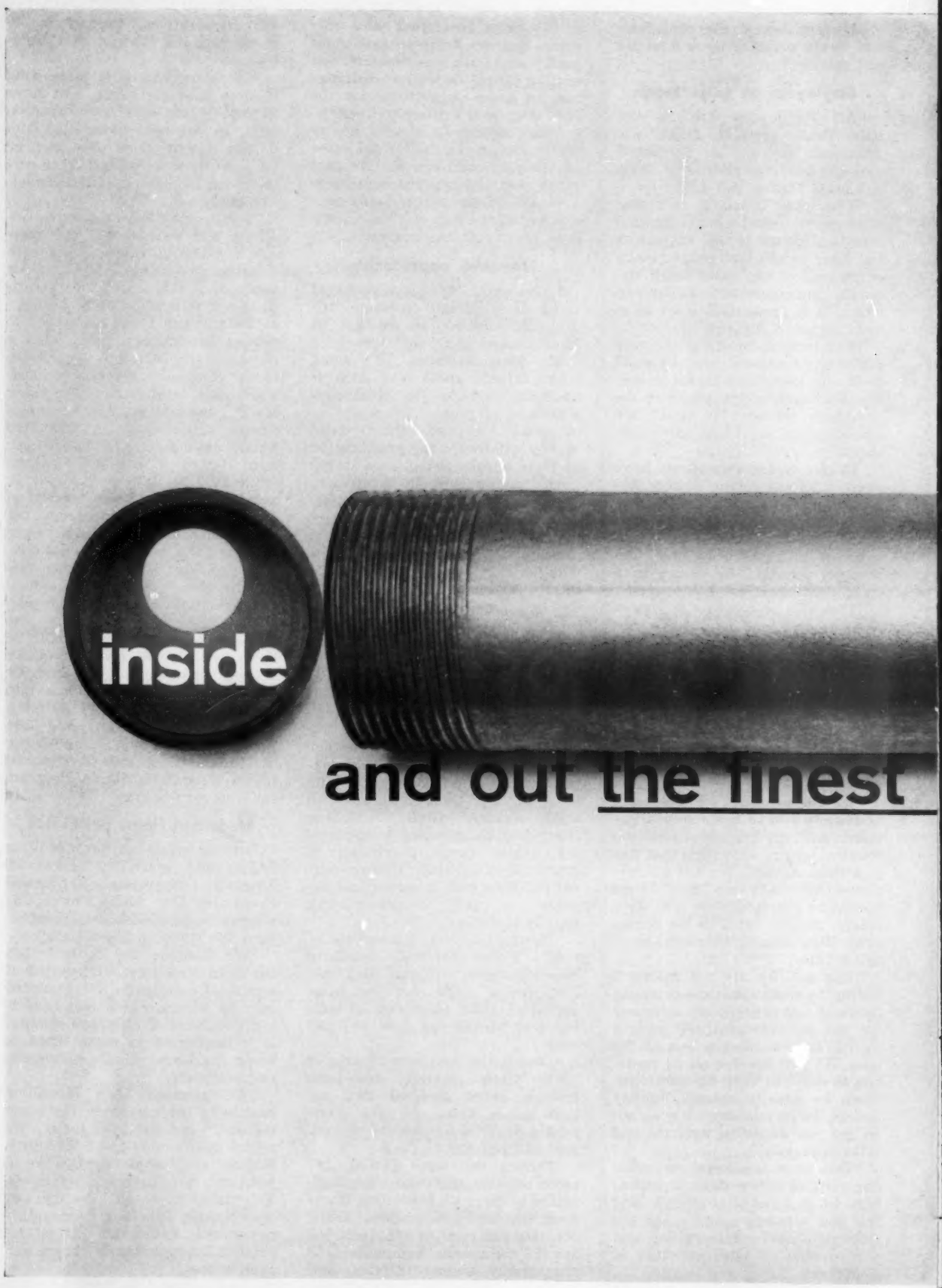
"I consider the difference between these estimated annual revenue figures, and the $90 estimated annual revenue for the average residential customer, to be the extra income which a utility derives each time it successfully promotes a Medallion Home into its line. The difference—$89 for a Bronze Medallion Home, and $301 for a Gold Medallion Home—is the 'value tag' which may be attached to the Medallion Home Program for your service area."

Medallion Home promotion

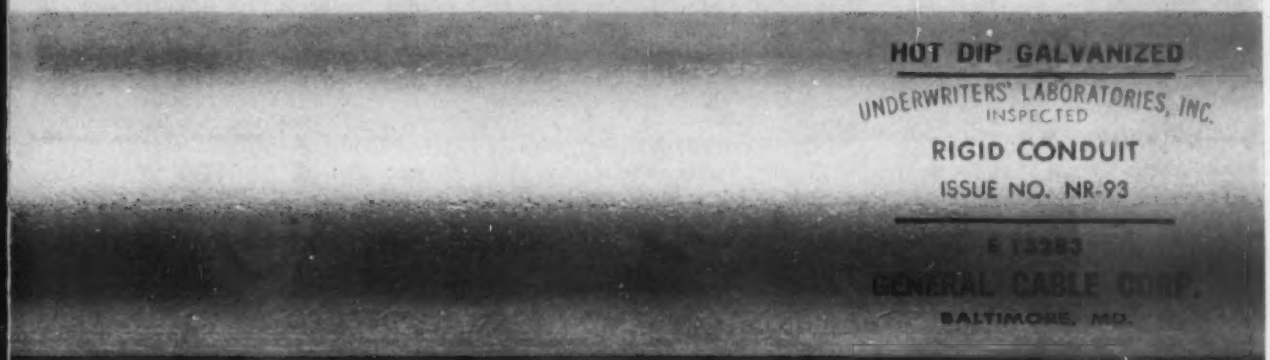
Further emphasis to Medallion homes was given by James M. Foreman, supervisor, Residential Promotion Div., Duke Power Co., who spoke on "Medallion Homes—How We Promote Them Locally."

"We promote the concept that the Gold Medallion is a symbol of electrical excellence. It is awarded only to homes which meet exacting standards of electrical quality. It is beginning to mean more to home builders, their customers, and prospects. . . .

"We promote Gold Medallion Homes to the customer, the home builder, and the dealers. We sound the theme—Gold Medallion Homes give something new in comfort, convenience, cleanliness. This theme is handled through our mass media advertising, including newspaper, radio, TV. It is expanded through home shows and open houses. . . .


inside
and out the finest

conduit: top quality steel, hot-dipped galvanized inside and out, guarantees a uniform protective zinc covering and ensures a super smooth inner surface for fast wire pulling. **threads:** no mechanical wiping of threads after dipping for full zinc protection; threads are protected from damage during storage or shipping by a removable plastic thread protector. **conduit and threads:** chromated to give excellent protection against white rust.



rigid steel conduit available

This exclusive 3 step method of quality control production assures you of the finest rigid steel conduit for every type of installation. Manufactured in a full range of sizes from ½" to 6", General Cable's rigid steel conduit is UL approved and meets Federal specification WW-C581C and ASA specification C-80.1-1959. Sold through electrical distributors.

General Cable Corporation,
730 Third Ave., N.Y. 17, N.Y.

GCC
GENERAL CABLE CORPORATION

"We promote open houses, inviting the interested public to tour the Gold Medallion Home as a means of acquainting them with latest features of electrical living and assisting the builder in his merchandising efforts. We have assisted builders in promoting 115 open houses attended by approximately 200,000 prospective customers. . . .

"A promotion allowance is paid to the builder to encourage his complying with our rigid specifications. We have found a builder is unwilling to make required changes to meet our Gold Medallion specifications unless there is incentive to do so."

Home lighting

George O. Mullan, manager of residential and farm marketing for the Potomac Edison System, presented "A New Approach to a Home Lighting Program. He outlined how the company's former home lighting promotion program had met with little success, and how he and the company's home service supervisor, Miss Lavetta Fraley, began a study in the fall of 1958 to find the causes of the failure and what could and should be done about it.

Their study showed that outside personnel were needed for counseling to determine the accuracy of the study and to add their own knowledge and experience. Joe Ditchman and Miss Aileen Page of General Electric's Nela Park staff accepted an invitation to help develop a program that would eliminate many of the objections to the existing home lighting program.

As a result of the counseling, it was decided to use the home demonstration extension service in each of the state universities to promote lighting.

It was believed that plans to continue the program would be enhanced if a meeting of representatives from the universities (Md., W. Va., and Pa.) and the home service department of Potomac Edison, along with Mr. Ditchman and Miss Page, took place.

The group decided to act as a committee and be known as the Three-State Lighting Committee. Virginia later joined the committee. The main objective of the committee was to make lighting recommendations as a result of cooperative analysis and study of each lighting activity in and around the home, for health, safety, comfort, and beauty.

To date the program has created favorable response from teachers, dealers, and individuals, and the Potomac Edison System believes the current approach to home lighting to be more effective than any to date.

"Electric Home Heating — Our Local Approach" was discussed at the conference by Howard B. Hicks, residential and rural sales manager, Carolina Power and Light Co.

"After months of study our management decided that the best way for us to accelerate residential sales would be to concentrate on electric heat. . . . As a result of this study our management announced . . . the following new sales tools to promote electric heating:

"New low rate for electric heating . . . , quick recovery water heater approved for total electric home . . . , budget billing . . . , housepower panel . . . , more manpower . . . , employee incentive plan . . . , heating manual . . . , electric heat advertising . . . , and promotional allowances for speculative builders. . . .

"We have been very pleased with the results of our new approach to house heating sales. The program was started in July, 1960, and from that date through October [1960] we have sold 420 electrically heated homes.

"For this same period in 1959 only 203 electrically heated homes were sold. This is an increase of 107 per cent. We anticipate for the next five years that we will sell a minimum of 3,600 heat pumps and 6,100 resistance heating jobs. This is big business. It amounts to about $12,535,000 for dealers and about $2,169,750 in estimated annual revenue for us."

Better lighting

George W. Clark, manager of marketing-fixtures, Sylvania Electric Products, Inc., presented a talk entitled, "Better Lighting — Better Equipment — Better Results."

"We're in an era of more light and entering an era of more sophisticated lighting which together spell better lighting. We're beginning to appreciate that good lighting design stems from *three* sciences—the three P's—physics, physiology, and psychology. *All* are important. Furthermore, we can anticipate greater emphasis on lighting not merely for *doing* but for *living*. . . .

"To meet the trends of lighting practices requires equipment whose design reflects these trends. Fortunately, such equipment is, by and large, available. Some stems from invention, some from new materials, and some simply from redesign to meet current trends in practice. . . ."

LBE Program

"The Live Better Electrically Program—1960-61" was outlined by Ralph Zeuthen, manager, the Live Better Electrically Program, Edison Electric Institute. His talk was supplemented with 21 slides.

"About five years ago, General Electric launched the Live Better Electrically program. Its purpose was to describe the competitive advantages of total electric living rather than the promotion of individual appliances or their brand names.

"GE hoped that two things would result:

"First, that the public would find in these ads a picture of a new way of living—a concept of a clean, healthful, modern home with electricity as the only source of energy.

"Second, that the whole electrical industry—utilities, manufacturers, and all our allies—would unite behind this leadership program and work together in presenting this total electric living concept to the public.

"At the beginning, GE disclosed that it would invest $9,000,000 in this program over a period of four years. It would then expect others in the industry to carry it on.

"When that time was up, at the end of 1959, the Edison Electric Institute absorbed the program and is now carrying it on.

"Some 150 investor-owned utilities now contribute to the program. The budget is approximately $2,700,000 a year. Sixty-nine per cent of this comes from straight electric companies, and 31 per cent from combination companies. . . .

"Last winter, the LBE Program invested $27,000 in a depth study to determine the state of mind of the American public as it examines the advertising of the electric and gas industries, and makes its choice.

"Three hundred interviews with both wives and men, lasting as long as two hours each, were conducted among middle income families in . . . 11 cities. . . .

"As we look ahead . . . it may be good advice to remind ourselves of the following:

"(1) Effective selling presents

(Continued on page 47)

R&S

BULLETIN 4-B

Watertight FLOOR BOXES

RUSSELL & STOLL COMPANY, INC. 125 BARCLAY STREET - NEW YORK 7, N.Y.

The widest range of quality

FLOOR BOXES, ACCESSORIES and EXTENSION FITTINGS

For every type of building project . . . . . .

THE FLOOR BOX YOU

LEGEND

Illustration No.	Catalog No.	Illustration No.	Catalog No.	Illustration No.	Catalog No.
A	3328FB	K	155LP	U	3044
B	2547	L	9583	V	3040
C	2512	M	2578	Y	FB20GC
D	AFO-157	N	2519	Z	FB1XC
E	2527-2540	O	2503	AA	3022G
F	2511	P	2644G	BB	3052G
G	2503-H	Q	3000G	BC	Blank Cover Cap.
H	TFO-12	R	2505	CC	3023G
I	2510	S	8059	DD	3058
J	151	T	2580	NK	2519K

NEED IS IN THIS PICTURE...

This group photo depicts all the different kinds of R & S floor boxes you'll need to meet every possible building construction application. Each floor box illustrated, is the typifying representative of its other styles or sizes . . . which all combined, comprise the complete R & S Floor Box Line.

You will find this *picture* and *legend* very handy to use as a floor box selector, reference guide and index.

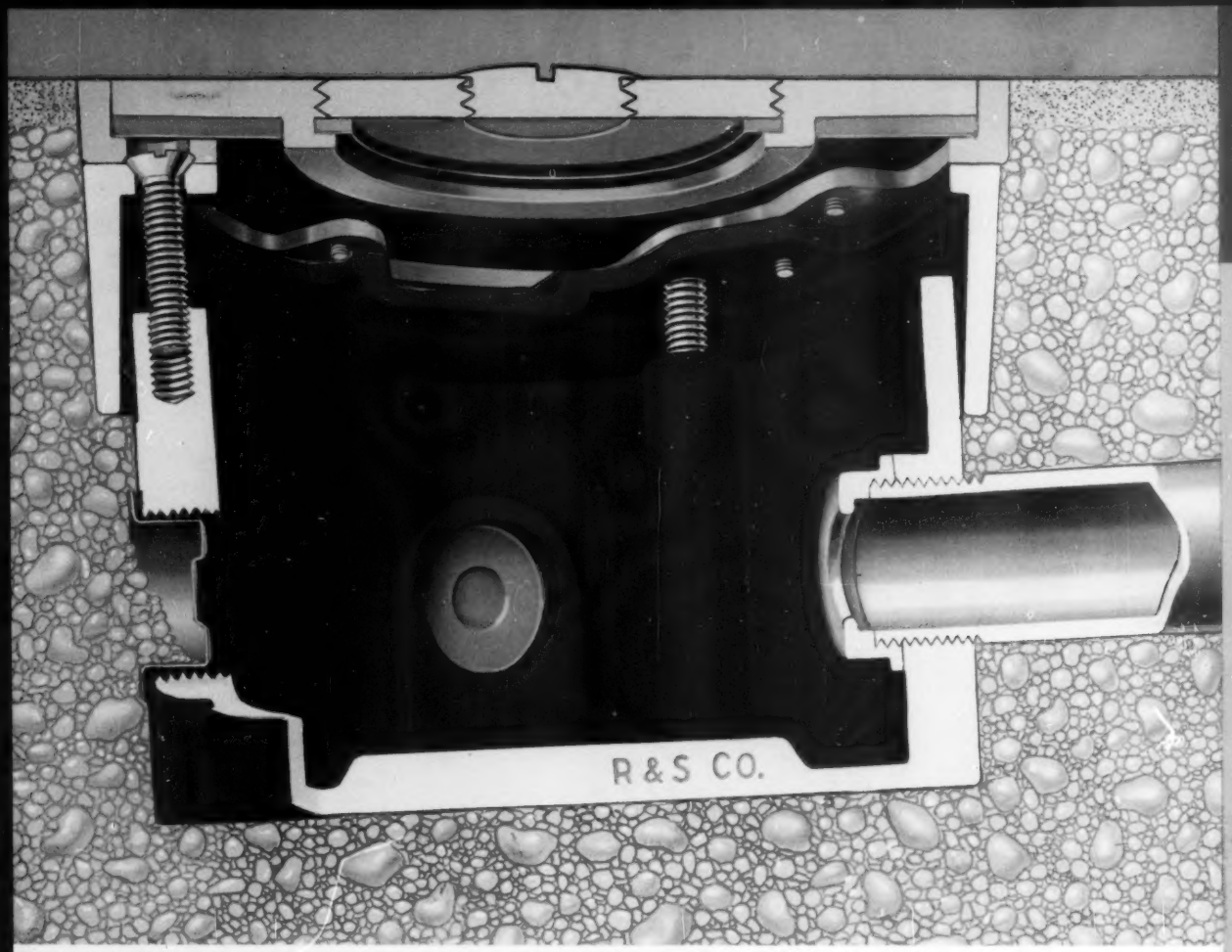
Architects, consulting engineers, contractors and builders know that floor boxes, despite look-alike cover plates when installed in floors, differ greatly in component constructions, specifications and quality. Moreover, these important differences in materials and design features affect performance and permanence.

That's why they favor and specify R & S floor boxes in the floors of the finest buildings here and abroad — to make *certain* of obtaining R & S built-in quality and to avoid any chance of costly failure and replacements after floor installations are completed.

Write for Your Copy!

R & S Floor Box Bulletin No. 4-B

All R & S Floor Boxes and Accessories, such as receptacles, plugs, extension sets, cone nozzles, elbows, tops and tees are described and illustrated in this 28-page bulletin. Write for your copy today!



ONLY RUSSELL & STOLL FLOOR BOXES HAVE *ALL* OF THESE 9 FEATURES...

❶ **Heavy Forged Brass Covers** —Special finishes to match adjacent hardware and trim available. Prices on application. *NOT:* STAMPED BRASS OR PLATED COVERS	❹ **Watertight Construction** —seals of durable rubber gaskets and wide, gasket-seating flanges *NOT:* FRAGILE, UNSUPPORTED SINGLE GASKETS, COLLARS OR BANDS — WITHOUT FLUSH CAP STOPS	❼ **Angular & Vertical Leveling** —adjusts easily from top to align cover flange flush with floor *NOT:* HARD-TO-REACH ADJUSTING SCREWS
❷ **Rugged, Corrosion-Resistant Cast Iron Boxes** —with tapped outlets or WITH SLIP HOLES *NOT:* SHEET STEEL WITH KNOCKOUTS	❺ **Positive Grounding** —continuous through leveling screws *NOT:* SPECIAL GROUNDING BONDING CEMENT FOR JOINTS — OR SPECIAL TOOLS	❽ **Accommodates Any Standard Receptacle** —having switch box mountings *NOT:* SPECIAL TYPES WHICH ARE NOT ALWAYS AVAILABLE
❸ **One-Piece Box Construction** *NOT:* SEPARATE PARTS	❻ **Ample, Unobstructed Wiring Space** *NOT:* RESTRICTED WIRING AREAS WHICH SLOW DOWN INSTALLATION	❾ **Furnished with Slip Holes in Boxes at same price**

7 NEW ELECTRICAL EQUIPMENT BULLETINS *Now Available...*

Bulletin No. 2-A — R & S LIGHTING FIXTURES BULLETIN
Explosion-Proof — Dust-Tight — Vaportight

- **Explosion-Proof Lighting Fixtures** — with Clear and Prismatic Globes, for hazardous locations, Class I, Groups C and D. Major applications: petroleum and chemical industries, rubber, paint and paint spray rooms — wherever explosive or flammable vapors or gases are present.
- **Dust-Tight Lighting Fixtures** — for Class II Groups E, F and G hazardous locations, such as grain elevators, flour processing, sugar refineries and areas where metal dusts and powders are processed — wherever combustible dusts may be present in the air in quantities sufficient to produce explosive or ignitible mixtures. All types of fixtures are shown, including the new bracket wall types.
- **Vaportight Lighting Fixtures** — pendent junction box and ceiling units, enclosed and gasketed, with and without reflectors; for outdoor lighting use including: airports and terminals, public buildings, docks, ships, platforms — indoors: breweries, dairies, boiler rooms, tunnels, cold storage, and many others in many fields.

Bulletin No. 3-A — R & S ELECTRICAL EQUIPMENT FOR RECREATIONAL AREAS
Features a wide variety of wet and dry niche types of swimming pool fixtures in both front and back relamp constructions, including new units first shown here. Fountain lights, decorative, step and curb lights are included — also, special types of vaportight lighting fixtures and receptacles used throughout recreational fields such as hotels, motels, parks and playgrounds.

Bulletin No. 4-B — WATERTIGHT FLOOR BOX BULLETIN
Preceding pages of this Insert illustrate the R & S complete floor box line. However, the 28 page Bulletin also contains many pages of technical data on individual floor boxes and accessories required by those who specify for specific installations.

Bulletin No. 7-A — R & S CIRCUIT BREAKERS AND SWITCHES BULLETIN
Includes many varieties of R & S Control Units used in the petroleum, chemical and petrochemical fields and by industry in many fields for the following hazardous locations:

Explosion-Proof — Class I, Groups C and D

Dust-Tight — Class II, Groups E, F and G, and Waterproof

Featured product lines include: Circuit Breakers, EFS and EGS Switches, FS and FD Switches, Tumbler Switches, Circuit Breaker and Receptacle Combinations, Disconnect Switches, etc.

Bulletin No. 11-B — R & S MARINE ELECTRICAL EQUIPMENT
Within the 44 pages of this book, you'll find the world's largest line of electrical equipment for shipyards and ships of all types, marinas, etc.

Explosion-Proof Marine Lighting Fixtures and Fittings, Vapor-tight and Waterproof Receptacles, Plugs, Connectors and Switches are featured. Also, a varied line of Water-Proof Lights: Cargo, Bulkhead, Pilot, Fresnel, Gage, Deck Mounting and Berth types.

Bulletin No. U-59 — R & S UNITIZED ALARM SYSTEMS
Fully described are Explosion-Proof, Vaportight and General Purpose Unilarm, Minilarm and Monolarm — panel and surface mounting alarm units for industrial process control and for Graphic and Flow Line Panels.

Ground Detector Unilarm Units are also featured for Hospital Operating Rooms — and the new Industrial Type Ground Detector Unilarm.

Bulletin No. 3157A—R & S SAF-T-ARC CIRCUIT BREAKING RECEPTACLES. PLUGS. CONNECTORS
Weathertight and Waterproof Type J Units in 4 complete lines — 30, 60, 100 and 200 Amperes, 600 Volts A. C., 250 Volts AC or DC.

R & S LITERATURE INCLUDES:
Hundreds of different types of Receptacles, Plugs, Connectors (Ever-Lok, Delayed Action, FS, FD and EFS). Explosion-Proof Pilot Lights, Push Buttons, Switches, Panels and other related items for hazardous locations. Motor Starters and Combinations and other Industrial Controls. Electical Specialties.

FOR ANY OF THE ABOVE BULLETINS, PLEASE REQUEST ON YOUR COMPANY LETTERHEAD. ADDRESS DEPT. 4:

RUSSELL & STOLL COMPANY, INC.

125 Barclay Street · **New York 7, N. Y.**

Southern Section Code questions

Another group of Code questions and answers presented at the recent meeting of the Southern Section, IAEI, in Houston

(19) Section 310-2(h-1).

Question: Where open circuit voltage exceeds 600 (795), what should be the voltage rating of conductors supplying remotely located ballasts of fluorescent lighting?

Answer: 1,000-volt rating. R or RH-10 if not over 1,000 volts.

(20) **Statement:** An installation of switches mounted on the outside of a cold storage vault is made of fittings containing a hub at the bottom rear of the fitting and feeds through the wall in conduit to a point immediately inside the vault where a seal-off of the self-draining type is installed. At this point the RC cable (3 conductor, one for equipment grounding the lighting fixture) is installed. This type of installation has not given any trouble to date.

Question: Does such an installation conform to the Code?

Answer: No. See 300-6.

(21) **Statement:** A recent new development involves installations of self-operated dry cleaning machines. The machines are operated by the customers, no operator on duty, and use perchlorethylene as a solvent.

Question: Is there any hazard involved and are there any such machines listed by Underwriters' Laboratories?

Answer: None listed by U.L. at this time. Hazards greatly reduced when listed. Proper vents are necessary.

(22) **Statement:** Several recent installations have been made in hazardous areas where seals have been placed in the conduit run as it comes out of the ground, thence to fittings enclosing arcing devices, with a seal at the top of the fitting. A union is used at the bottom entrance.

Question: Is this a violation of the Code even though two seals are used, and where in the Code is the exact location of seals specified?

Answer: Yes, unless the seal is within 18 inches of the enclosure. See 501-5.

(23) **Statement:** Table 5, columns 2 and 3, have type THW listed in the heading. The first fine print note states that THW is the same size as RW; however Table 310-28 states that THW in size No. 6 and larger has the same insulation thickness as TW which is shown in column 5 of Table 5.

Question: In computing raceway fill for rewiring existing raceways may column 5 of Table 5 be used for conductors No. 6 and larger of type THW?

Answer: Yes.

(24) **Statement:** An underground service of No. 2 conductors is installed for a service station and is routed through a hazardous area as defined in Section 514-2.

Question: (A) Are there any approved conductors available for this location?

(B) If the answer to (A) is "no," would machine tool wire which has 4/64-inch PVC insulation and is recommended for use up to 80 C in oil, be suitable?

Answer: (A) Available from one manufacturer. (B) No; not listed where may be subject to gasoline.

(25) **Question:** May the disposal switch installed in the sink drain be considered as a disconnecting switch for the unit?

Answer: No. May be dangerous to use even if it was permitted.

(26) Sections 336-3 and 339-3.

Statement: In cold storage vaults we find it is impossible to prevent moisture collecting in vapor-tight fixtures, conduit fittings, etc.

Question: Would the code permit the use of type UF cable with a grounding conductor in such locations?

Answer: Yes, if also conforming to requirements for installing type NMC cable. Type UF cable may also be marked NMC but not required.

(27) **Question:** Could Underwriters' Laboratories be requested to require grounding type attachment plugs on kitchen appliances? Why put grounding type receptacles in kitchens with nothing properly equipped for their use?

Answer: Yes. The subject is now being considered. Very controversial as to extent it should be required.

(28) **Question:** Could the Code be worded to require two 20-ampere branch circuits for appliances in the kitchen only, instead of extending present two or more to the other locations specified?

Answer: Yes. Proposal adopted at this meeting to require three 20-ampere branch circuits, two of which shall supply only the kitchen receptacles, the receptacles to be equally divided between the two branch circuits.

(29) Sections 220-2(c) and 220-4(b).

Statement: Is there any conflict between these two Sections, the first paragraph states you "may" and the last states you "shall?"

Answer: No conflict. One requirement is for branch circuits and the other for feeders. It is intended by "may" that either may be used for branch circuits.

(30) Sections 210-24(c), 210-19(d), 422-14.

Question: Is it the intent that 40-ampere capacity conductors and 40-ampere overcurrent protection be permitted to supply wall-mounted ovens and counter-mounted cooking units on the same circuit?

Answer: No.

(31) Section 310-10.

Question: Is it the intent that the 1/0 limitation on conductors in multiple be applicable to neutral conductors as well as hot conductors?

Answer: Yes.

(32) **Question:** Where several small equipment grounding conductors are enclosed in the same conduit to provide against physical injury, what percentage of fill is

(Continued on page 99)

Contractors tell how

Two-way radio brings better coordination, less driving

By C. Thomas, Electrical South Field Editor, El Paso, Texas.

◆ When miles of driving cut into servicing profits for Nelson Electric Co., El Paso, Texas, the company went to radio for faster communications, better coordination, and less driving.

Setting up a two-way radio system, the Nelson company equipped each of their eight service vehicles with facilities for sending and receiving messages.

Four of the vehicles are assigned to specific territories, explained Ronald Nelson, son of the founder, Edward M. Nelson. These are service trucks, stocked with emergency tools and materials. These four units have no definite boundaries as such, and because of the nature of the business, there has to be some overlapping. However, each truck can remain within a certain section of town, eliminating the back tracking that otherwise would result.

Because each crew works in a certain section, the journeyman and his helpers have a better chance for getting to know their customers and become better acquainted with each one's problems and equipment.

Nelson Electric does not sell or service household appliances, with the exception of electric ranges and water heaters. Consequently their service work entails mainly jobs for commercial and industrial accounts.

The company reserves one utility truck for trouble shooting. This has been found to be more practical than dispatching one of the regular territory crews into another's territory. Also, all four could easily be on a job and not be immediately available. This special truck is also used to rush materials directly to crews on permanent jobs, as well as to the service crews.

Two station wagons are also equipped with two-way radios, primarily for use by the estimators. The advantage here is that the estimator, figuring a small job, can make a mental summary of the job's needs and get priced out by calling in to the Nelson office from his mobile unit, without ever leaving the scene. This is for small jobs and service work. Major jobs, of course, have to be handled in the conventional manner.

"Giving the customer a prompt, accurate estimate often closes the deal on the spot," says Mr. Nelson.

Truck's boom-winch proves worth

By Elmer French, Whelchel Electric Co., Sarasota, Fla.

◆ When we discovered it was time for us to begin outfitting our organization with boom-winch trucks for wire pulling and similar work, we also discovered that good used boom-equipped trucks were non-existent in our area, and that new ones were extremely expensive.

We located our first boom in Michigan, and it paid us to have it brought here. It doesn't matter that the body needed reconditioning and will be painted white after the unit is rejuvenated. Body repairs can always be made at reasonable cost, or if worn out, it even pays to replace the entire truck chassis, and mount the boom back atop a replacement mobile unit, rather than tie up a large chunk of capital in a new boom.

The boom has a long life and is versatile enough to make it a top time and labor-saver for the busy contractor, and it will outlast a number of chassis. We saved a considerable sum by locating the unit we're now readying for our work.

This truck, with boom-winch overhead, is one of several used by the Whelchel Electric Co., Sarasota, Fla. The company feels the boom is a valuable asset to the electrical contracting business.

This pick-up and delivery man is being contacted at a supplier and given orders to pick up materials.

Still another vehicle, a free wheeling unit, is also two-way radio equipped. This is used to dispatch workmen to jobs, to transport them from one job to another, and for pick-up and delivery.

"The initial cost of the radio system," says Mr. Nelson, "was right at $8,000, which included the cost of our transmitter, located up on Mt. Franklin for better coverage of the area." Within a year and a half, the resulting savings have easily paid for the communication set-up, he said.

"It's the lost time in the business that eats up what otherwise would be profit," said Mr. Nelson. "Needless coming and going is not only wasted travel expense; there is truck expense involved. When we first set up our present system, we kept account of mileage saved. On some units, we saved as much as 100 miles of driving a day. The average was right at 50 miles a day.

"Using national figures which show it costs $.15 a mile to operate a small truck, there is an actual saving of $60 a day, not to figure in the lost man hours per day driving those needless 400 miles."

The company has trained a girl as a dispatcher. She also keeps a record of the jobs and gathers the prices from the price books for the various journeymen and estimators.

"This system keeps us flexible to the extent that we are keeping our crews on the job with very little stand-by time to absorb," Mr. Nelson concluded, "and no needless mileage expense."

One man can mount large fixtures by using this practical support unit

By Fred Goette, Stewart-Goette Electric Co., Macon, Ga.

◆ How many men does it take to install fluorescent fixtures? At least two, you say?

Not so, if you equip your shop with a fixture stand such as the one shown here. One man can easily handle even four-lamp eight-foot fixtures and cut time on the job 30 to 50 per cent.

The stand can be made for the most part from scrap materials cluttering up a shop. The only purchase we made was for the four casters for the base.

A one-inch cross fitting forms the nucleus of the base. A hole was drilled vertically through the center of this fitting and a ten-inch section of ¾-inch conduit fitted into it and welded into place. This strengthens the main post of the stand when it is in use.

A one-inch coupling was then welded in place concentrically with the ten-inch stub. The main post of the stand screws into this fitting. The legs are fitted into the cross fittings and small rollers attached to them.

The main post of the stand consists of a five-foot, eight-inch length of conduit telescoped into a like length of 1¼-inch steel tubing. A pin inserted in holes drilled at six-inch intervals in the center (conduit) member of the post provides rough adjustment of the stand's height.

Fine adjustment is provided by the hand wheel on the fixture holder. This was made very simply

(Continued on page 101)

Here is an over-all view of the fixture holder. The electrician is adjusting the coarse height by moving the pin in the holes bored at six-inch intervals.

The support is attached to the all-thread stem and the hand wheel used to make fine height adjustment.

Understanding the Code

This article should be especially helpful to the following readers:

- Electrical Contractors
- Electric Utilities
- Electrical Wholesalers
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

By Walter R. Stone, Contributing Editor on Code Rules, Utica, N. Y.

◆ Having discussed the general provisions of transformers in the last issue of this magazine, we continue in this issue with specific provisions applicable to the various types of transformers and to transformer vaults.

The Code separates transformers into three basic types: (1) dry-type, (2) Askarel-insulated, and (3) oil-insulated. The rules are more rigid for oil-insulated transformers than for the other two types. These rules include provisions for outdoor as well as for indoor installations for oil-insulated transformers; whereas for dry-type and for Askarel-insulated transformers provisions for indoor use only are contained in the Code.

All transformers, regardless of the type, which are rated at more than 15,000 volts are required by Sections 450-21, 450-23, and 450-24 to be installed in vaults. (The Code requirements for vaults will be discussed later in this article in connection with Sections 450-41 through 450-48, Part C, of the Code. These rules requiring such high- voltage transformers to be installed inside of vaults are consistent with the provisions of Section 230-101(h) which, with reference to conductors entering buildings, states, "Where the voltage exceeds 15,000 volts between conductors they shall enter a transformer vault conforming to the requirements of Section 450-41 to 450-48."

Rules for dry-type units

Dry-type transformers of more than 112½ kva rating are required by Section 450-21 to be installed ". . . in a transformer room of fire-resistant construction . . ." except under the following conditions: Where such transformers are constructed with Class B insulation

Code test questions

1. Dry-type transformers exceeding 112½ kva and 600 volts in rating are required to be installed in a transformer vault. True or false?

2. An Askarel-insulated transformer of over 25 kva which has no means for absorbing gases generated by arcing inside the case and which is installed in a poorly ventilated room is required to have a pressure-relief vent connected to a chimney or flue which will carry the gases outside of the building. True or false?

3. Oil-insulated transformers having a total capacity not exceeding 112½ kva may be installed in a transformer vault having reinforced concrete walls not less than 4 inches thick. True or false?

4. An oil-insulated transformer is not required to be installed inside of a vault if the potential is 600 volts or less and the capacity is 10 kva or less where it is installed in a building classified as combustible provided suitable arrangements are made to prevent a transformer oil fire from igniting other materials. True or false?

5. An oil-insulated transformer installed outdoors is not permitted to depend on trenches filled with crushed stone to confine the oil in the event of a ruptured tank. True or false?

6. A transformer vault is required to have roofs and walls of the following minimum thickness:

(a) 6 inches if of reinforced concrete, 8 inches if of brick, 12 inches if of load-bearing hollow tile or of load-bearing concrete hollow building blocks.

(b) 4 inches if of reinforced concrete, 6 inches if of brick, 8 inches if of load-bearing hollow tile or load - bearing hollow concrete building blocks.

(c) 8 inches regardless of the type masonry used. Which is correct a? b? or c?

7. A transformer vault is required to have a concrete floor of not less than the following minimum thickness:

(a) 4 inches.

(b) 6 inches.

(c) 8 inches.

Which is correct? a? b? or c?

8. A transformer vault doorway leading into a building is required to have a door sill or curb of sufficient height to confine within the vault:

(a) the oil from all of the transformers, but in no case less than 8 inches in height.

(b) the oil from all of the transformers, but in no case less than 4 inches in height.

(c) the oil from the largest transformer, but in no case less than 4 inches in height.

Which is correct? a? b? or c?

9. Ventilation openings in transformer vaults shall be located:

(a) where the best ventilation will result, without regard to doors and windows.

(b) as far away as possible from doors and windws.

(c) as near as practicable to doors and windows.

Which is correct? a? b? or c?

10. The residual voltage of a capacitor shall be reduced to 50 volts or less upon removal of voltage from the line through a discharge circuit. This discharge circuit is required to be connected by means of:

(a) a manually operable shunt.

(b) a manually operable switch.

(c) an automatic device or be permanently connected to the terminals.

Which is correct? a? b? or c?

Correct answers will be found at end of article on page 47.

(80 C rise) or Class H insulation (150 C rise), they may be installed outside of a fire-resistant transformer room provided that they ". . . are separated from combustible material not less than 6 feet horizontally and 12 feet vertically or are separated therefrom by a fire resistant heat-insulating barrier."

(The fire-resistant transformer room referred to in this section of the Code is not required to comply with the provisions of a vault referred to in Sections 450-41 through 450-48, Part C, of the Code.)

Dry-type transformers rated at 112½ kva or less are required by Section 450-21 to be (1) separated from combustible material at least 12 inches; (2) separated from combustible material by a fire-resistant, heat-insulating barrier; or (3) be completely enclosed except for ventilating openings and be limited in potential to 600 volts or less.

The rules for Askarel-insulated transformers sometimes are tended to be treated with some laxity. This, perhaps, arises from a superficial reading of the definition of Askarel in Article 100 and from a lack of attention to Section 450-23 in Article 450. Askarel is defined as being "A synthetic nonflammable insulating liquid which, when decomposed by the electric arc, evolves only nonflammable gaseous mixtures." Although nonflammable, the gaseous mixtures are nonetheless produced and emitted when the Askarel is so decomposed by the arc. Therefore, the Code requires that some means be provided to dispose of such gases under certain conditions as follows:

Askarel-insulated transformers rated at more than 25 kva are required by Section 450-23 to be furnished with a pressure-relief vent. This section further states, "Where installed in a poorly ventilated place they shall be furnished with a means for absorbing any gases generated by arcing inside of the case, or the pressure relief vent shall be connected to a chimney or flue which will carry such gases outside the building." In most cases, proper ventilation is provided in the room where such transformers are installed.

Rules for oil-filled units

Oil-insulated transformers are required by Section 450-24 to be installed in a vault except as follows:

(1) Transformers with a total capacity of not over 112½ kva may be installed in a modified vault ". . . constructed of reinforced concrete not less than 4 inches thick." (Standard vault requirements will be discussed later in this article.)

(2) Where the potential of an oil-insulated transformer does not exceed 600 volts, a vault is not required provided that suitable precautions are taken to prevent any transformer oil fire from igniting other materials and provided further that the total transformer capacity in any one area does not exceed (a) 10 kva in any section of a building classified as combustible, or (b) 75 kva in any section of a building classified as structurally fire-resistant.

(3) Oil-insulated electric furnace transformers having a total capacity of not over 75 kva may be installed outside of a vault if in a structurally fire-resistant building or room, provided that suitable precaution is taken to prevent any transformer oil fire from spreading to or igniting combustible material.

(4) Oil-insulated transformers may be installed outside of a vault in detached buildings provided that (a) neither the building nor its contents constitute a fire hazard to other buildings or property, and (b) the building is used only for supplying electric service and its interior is accessible only to qualified persons.

Outside installation

The Code has provisions, also, for governing the installation of oil-insulated transformers out of doors.

Section 450-25 states, "Combustible material, combustible buildings and parts of buildings, fire escapes, door and window openings shall be safeguarded from fires originating in oil-insulated transformers installed on, attached to, or adjacent to a building or combustible material. Space separations, fire-resistant barriers and enclosures which confine the oil of a ruptured transformer tank are recognized safeguards. One or more of these safeguards shall be applied according to the degree of hazard involved in cases where the transformer installation presents a fire hazard.

Oil enclosures may consist of fire-resistant dikes, curbed areas or basins, or trenches filled with coarse crushed stone. Oil enclosures shall be provided with trapped drains in cases where the exposure and the quantity of oil involved are such that removal of oil is important."

Vault requirements

Transformer vaults, mentioned earlier in this article, are required by Section 450-41 to be so situated that they can be ventilated to the outside air ". . . without using flues or ducts wherever such an arrangement is practicable."

The minimum structural requirements for vaults are specified in Section 450-42. The walls and roof are required to be of masonry construction of the following minimum dimensions for the following types of masonry: reinforced concrete, 6 inches thick; brick, 8 inches thick; load-bearing hollow tile, 12 inches thick; or load-bearing hollow concrete building blocks, 12 inches thick. The inner surfaces of hollow tile or hollow building blocks are required to be coated with a minimum thickness of 3/4 of an inch of cement or gypsum plaster. The vault floor is required to have a concrete floor not less than 4 inches thick.

Building walls and floors which meet these minimum requirements are permitted to be utilized as the roof, floor, or walls of the vault. For instance, one corner of a building basement may be utilized for the roof, floor, and two walls of a vault leaving only two walls remaining to be constructed where the building itself has the minimum requirements for vault construction.

Section 450-42 further states, "Other forms of fire-resistive construction are also acceptable provided they have adequate structural strength for the conditions and a minimum fire resistance of two and one-half hours according to ASTM Fire Test Standard E119. The quality of the material used in the construction of the vault shall be of the grade approved by the inspection authority having jurisdiction."

Most inspection authorities are reluctant to accept any substitutes for the specified masonry construction, being unequipped to make tests of the structural strength of materials and structures. Any material submitted with sufficient proof of equal strength would also be required, of course, to have the minimum 2½-hour fire resistance rating. Substitute materials are seldom encountered by inspection authorities, but masonry which does not meet minimum thickness requirements is not uncommon.

Doorways are required by Section 450-43 to be protected in the following manner when such door-

ways lead from the vault into the building: (Many engineers specify equal treatment of doorways leading from a vault directly to the outside of a building. But this is not a requirement of the Code.)

(1) Each such doorway is required to be provided with a tight-fitting Class A fire door which complies with the minimum standards of NFPA Bulletin No. 80 for such doors.

(2) Each such doorway is required to be provided with a door sill or curb of sufficient height to confine within the vault all of the oil from the largest transformer. In no case is the height of the curb permitted to be less than 4 inches.

(3) Each such doorway is required to be provided with a lock, and doors are required to be kept locked. Any lock or latch is required to be so arranged that the door may be quickly opened from the inside.

A Class A fire door may be required on each side of a doorway by the inspection authority having jurisdiction where he deems it necessary for safety. This extra precaution is seldom required by such authorities, however.

Transformer temperatures are limited to the values which are safe for the various types. The maximum values for these various types are listed by American Standard for Transformers C57.10-1953. Transformer vaults are required by Section 450-44 of the Code to have ventilation adequate to prevent transformer temperatures in excess of the values listed by this American Standard.

Ventilation provisions

Where ventilation is necessary in vaults to prevent excessive transformer temperatures, Section 450-45 requires that the ventilation openings, ducts, coverings, sizes, and arrangements meet the following minimum standards:

(1) Ventilation openings are required to be situated as far as possible from doors, windows, fire escapes, and combustible material. Where natural ventilation is utilized, the openings may be (a) roughly divided so that half of the total area is placed near the floor in one or more openings and half near the roof in one or more openings, or (b) all of the required area may be provided in one or more openings near the roof.

(2) Where vaults are ventilated directly to the outside without the use of ducts, the combined net area

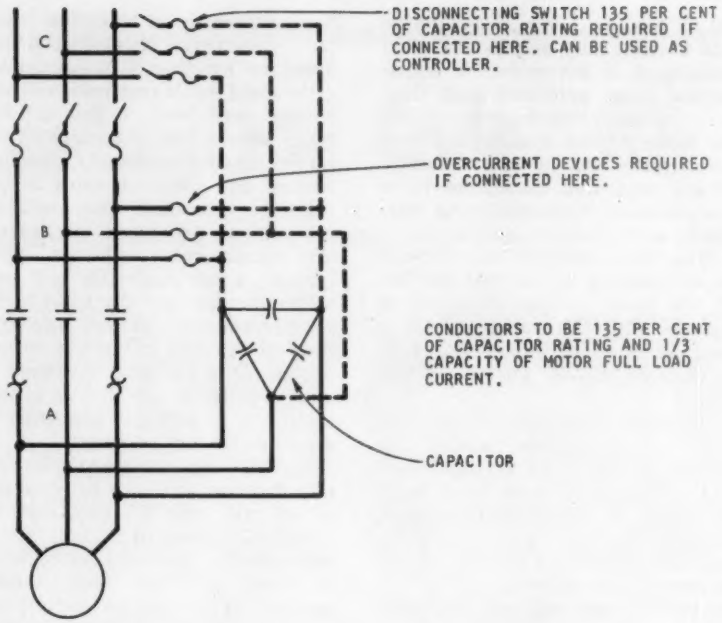

C
B
A
DISCONNECTING SWITCH 135 PER CENT OF CAPACITOR RATING REQUIRED IF CONNECTED HERE. CAN BE USED AS CONTROLLER.
OVERCURRENT DEVICES REQUIRED IF CONNECTED HERE.
CONDUCTORS TO BE 135 PER CENT OF CAPACITOR RATING AND 1/3 CAPACITY OF MOTOR FULL LOAD CURRENT.
CAPACITOR

Fig. 1—Motor overcurrent devices, if of adjustable type, must be lowered in rating when the capacitor is connected at "A."

of ventilation openings after deductions for gratings, louvers, or screens, ". . . shall be not less than 3 square inches per kva of transformer capacity in service, except that the net area shall be not less than 1 square foot for any capacity under 50 kva."

(3) "Ventilation openings shall be covered with durable gratings, screens, or louvers, according to the treatment required in order to avoid unsafe conditions."

(4) Ventilating ducts are required to be constructed of fire-resistant material.

(5) "Where automatic dampers are used in the ventilation openings in vaults containing oil-insulated transformers, the actuating device should be made to function at a temperature resulting from fire and not at a temperature which might prevail as a result of an overheated transformer or bank of transformers. Automatic dampers should be so designed and constructed to minimize the possibility of accidental closing."

Although the provisions listed in paragarph (5) above for automatic dampers constitute recommendations instead of requirements, it is at once apparent that if the dampers should close as a result of transformer temperatures such temperatures would immediately rise still higher as a result of the closing of the dampers. Where the dampers close only in case of fire, on the other hand, the action would result in the cutting off of ventilation to the fire which would reduce the hazard.

It should be noted in paragraph (1) above—and it is worth repeating here—that ventilation openings are required to be as far removed as possible from all doors, windows, fire escapes, and combustible material. This is to prevent the spread of fire to other areas in the event of a fire in the vault, and to prevent possible injury to persons while they are using fire escapes, passing through doors, or passing near windows. Such ventilation openings are required therefore to be isolated as much as possible from combustible material and from inhabited areas or passageways.

Unless local conditions make it impracticable to do so, vaults containing a transformer or a bank of transformers with a capacity in excess of 100 kva are required by Section 450-46 to be provided with a floor drain.

Section 450-47 recommends that piping, ducts, etc., which are foreign to the electrical system be not allowed to enter or pass through a transformer vault. This section requires that where inclusion of such systems cannot be avoided, ". . . appurtenances thereto which require maintenance at regular intervals shall not be lo-

cated inside the vault."

The same section requires, also, that precaution be taken to avoid condensation, leaks, and breaks in such foreign systems. Transformer cooling systems and fire sprinkler systems are not deemed foreign to the electrical system and therefore may be installed in the vault. Materials are prohibited by Section 450-48 from being stored in transformer vaults.

Capacitors covered

Vaults are sometimes required for capacitors as well as for transformers. Section 460-2 states, "An installation of capacitors in which any single unit contains more than three gallons of combustible liquid shall be in a vault conforming to Part C of Article 450."

Capacitors are required by Section 460-4 to be provided with noncombustible cases and supports, and by Section 460-3 to be protected from physical damage by location or by suitable barriers, fences, or other enclosures.

A transformer which connects a capacitor to a power circuit is required by Section 460-5 to have a kva rating equal to not less than 135 per cent of the kvar rating of the capacitor. Such transformers are used when it is desired to supply the capacitors at a potential different from that of the system.

Capacitors are required by Section 460-6 to have a means of draining the stored charge within a minimum specified time as follows:

(1) The residual voltage of a capacitor shall be reduced to 50 volts or less (a) within one minute after the capacitor has been disconnected from its supply for capacitors rated at 600 volts or less, and (b) within 5 minutes after the capacitor has been disconnected from its supply for capacitors rated at more than 600 volts.

(2) The circuit through which the residual voltage is discharged after the capacitor or capacitor bank is disconnected from its supply is required to be (a) permanently connected to the terminals of the capacitor or capacitor bank, or (b) be provided with an automatic means of connecting it to the terminals of the capacitor or capacitor bank upon removal of voltage to the line.

"Manual means of switching or connecting the discharge circuit shall not be used. The winding of motors, or of other equipment directly connected to capacitors without a switch or overcurrent device interposed, constitutes a suitable discharge means."

Section 460-7 prohibits the connection on the load side of a motor controller any capacitor or capacitor bank having a total kvar rating larger than that necessary to raise the no-load power factor of the motor to unity. No other size requirement for capacitors is stated in the Code. For recommended capacitor size requirements for various motor loads, the motor manufacturer should be consulted.

Capacitor wiring rules

The current-carrying capacity of the circuit conductors of a capacitor is required by Section 460-8 (a) to be not less than 135 per cent of the capacitor current rating in any case; and where the capacitor conductors connect to terminals of a motor or a motor circuit, they are required, in addition, to have a current-carrying capacity at least 1/3 that of the motor circuit conductors. See A in Figure 1.

Paragraph (b) of Section 460-8 requires that an overcurrent device be placed in each ungrounded conductor of a capacitor circuit unless the capacitor is connected on the load side of a motor-running overcurrent (overload) device in which case it is not required. The rating or setting of such overcurrent devices is required to be as low as practicable. See B in Figure 1.

A disconnecting means is required by Paragraph (c) of Section 460-8 to be provided in each ungrounded conductor of a capacitor circuit unless the capacitor is connected on the load side of the motor overcurrent device in which case it is not required. See C in Figure 1.

The continuous current-carrying capacity of the disconnecting means is required to be not less than 135 per cent of the capacitor current rating. The disconnecting means is permitted to be used as the controller for removing the capacitor from the line and is not required to open all conductors simultaneously.

The rating or setting of the motor-running overcurrent (overload) device (as distinct from an overcurrent device protecting the capacitor) is required by Section 460-9 to be adjusted downward corresponding with the lower value of the current as a result of power factor correction.

No correction is required for non-adjustable type overcurrent devices when used in similar cases. The size of the motor circuit conductors is *not* permitted to be reduced in size, however, after adding capacitors. These conductors, in all cases, must have a current-carrying capacity equal to not less than 125 per cent of the rated full-load current of the motor. See A Figure 1.

Capacitor cases are required by Section 460-10 to be grounded. Live parts of capacitors supplied by potentials exceeding 600 volts are required by Section 460-11 to be enclosed or isolated if accessible to unqualified persons.

Section 460-12 requires each capacitor to be provided with a nameplate giving ". . . maker's name, rated voltage, frequency, kvar, or amperes, number of phases, and if filled with a combustible liquid, the amount of liquid in gallons. When filled with a non-flammable liquid, the nameplate shall so state. The nameplate shall also indicate if a capacitor has a discharge device inside the case."

Answers to Code test questions: (1. **F** Section 450-21) (2. **T** Section 450-23) (3. **T** Section 450-24-a) (4. **T** Section 450-24-b) (5. **F** Section 450-25) (6. **a** Section 450-42) (7. **a** Section 450-42) (8. **c** Section 450-43-b) (9. **b** Section 450-45-a) (10. **c** Section 460-6).

SEE conference

(Continued from page 34)

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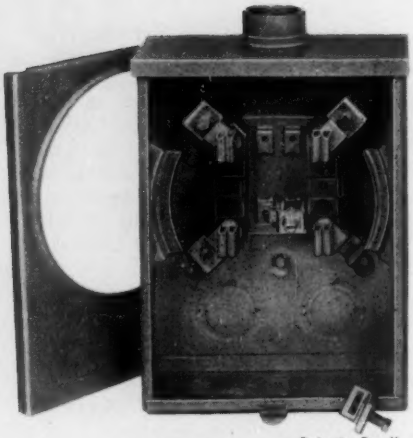

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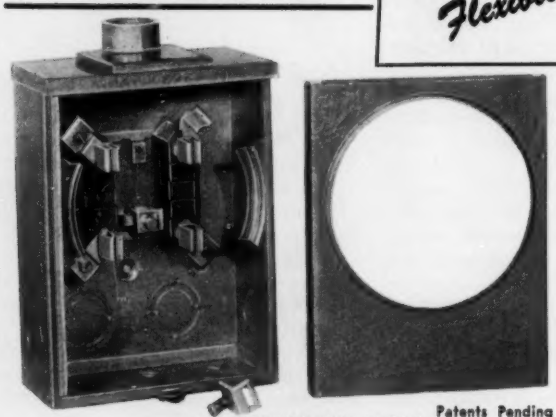

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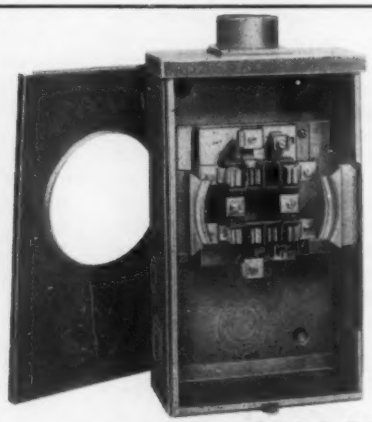

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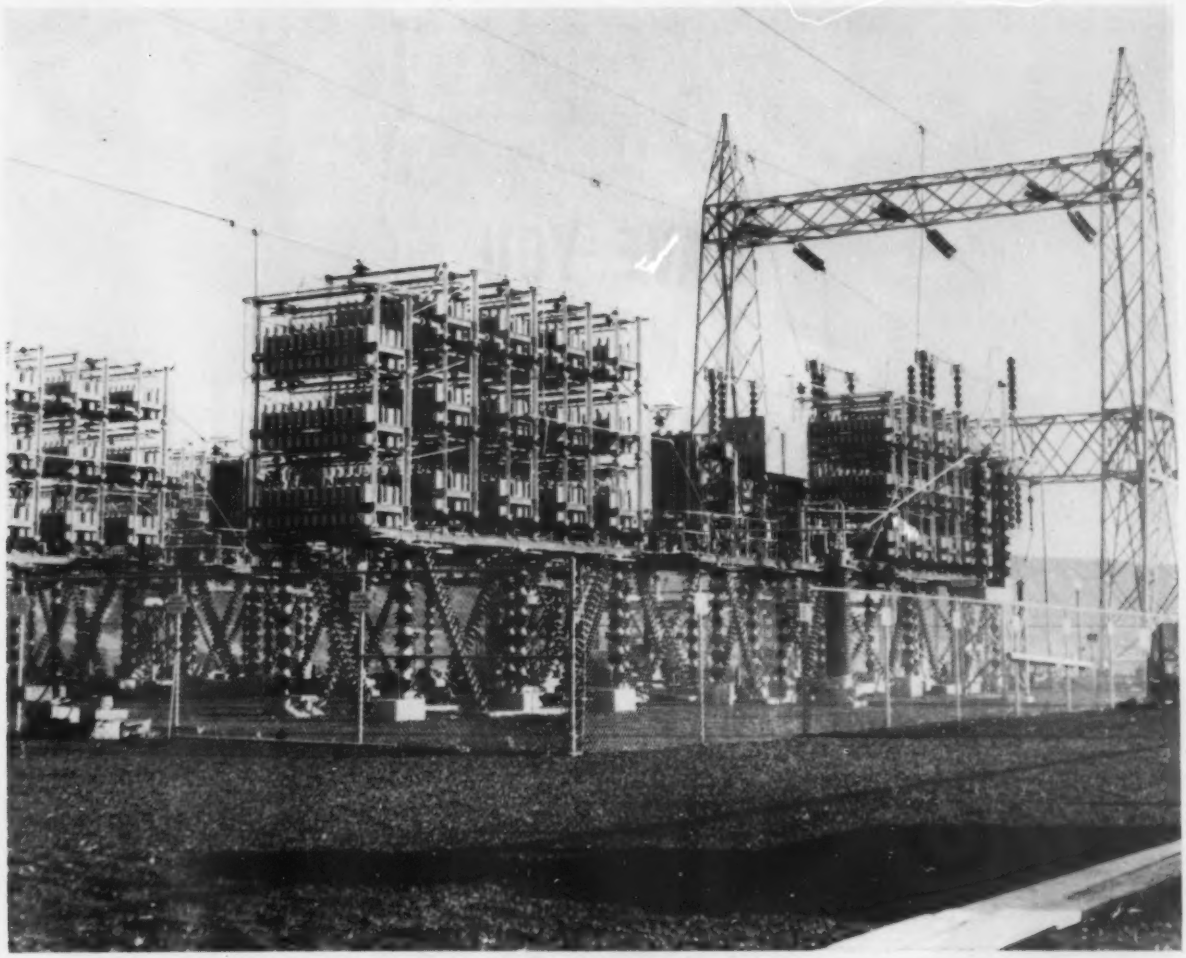

This bank of 2,160 50-kvar capacitors balances loading on Bonneville 345-kv system—page 70

Project EHV sets line voltage record—page 62
TVA builds seven-mile EHV section—page 64
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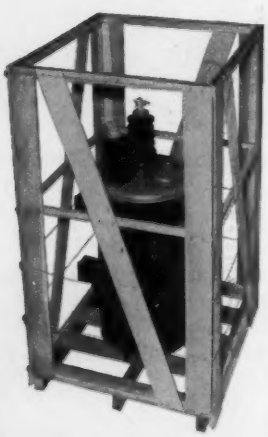

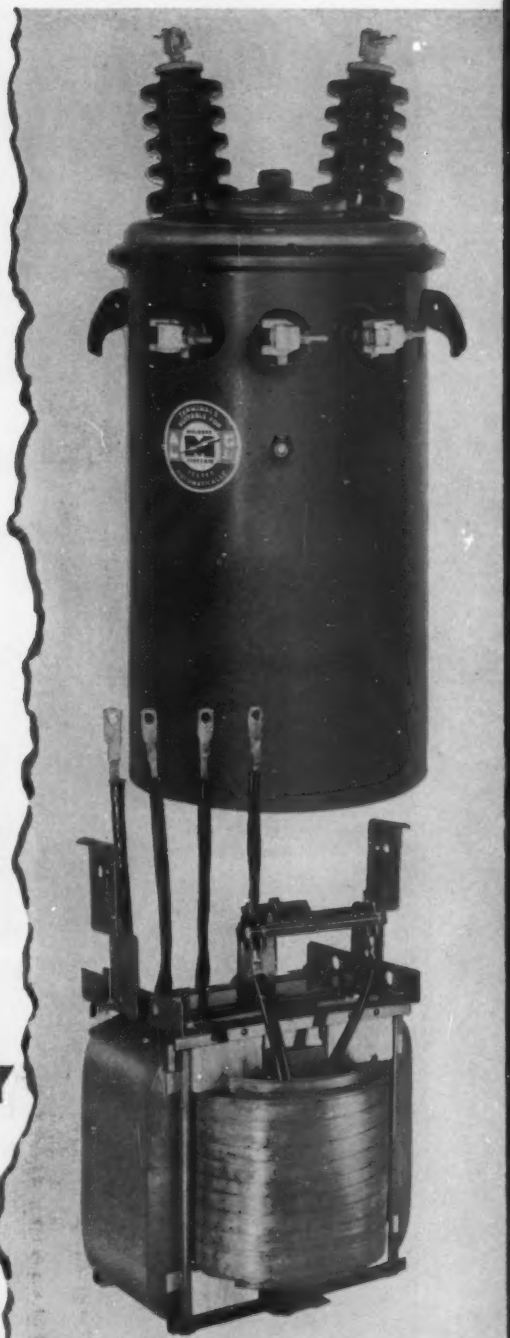

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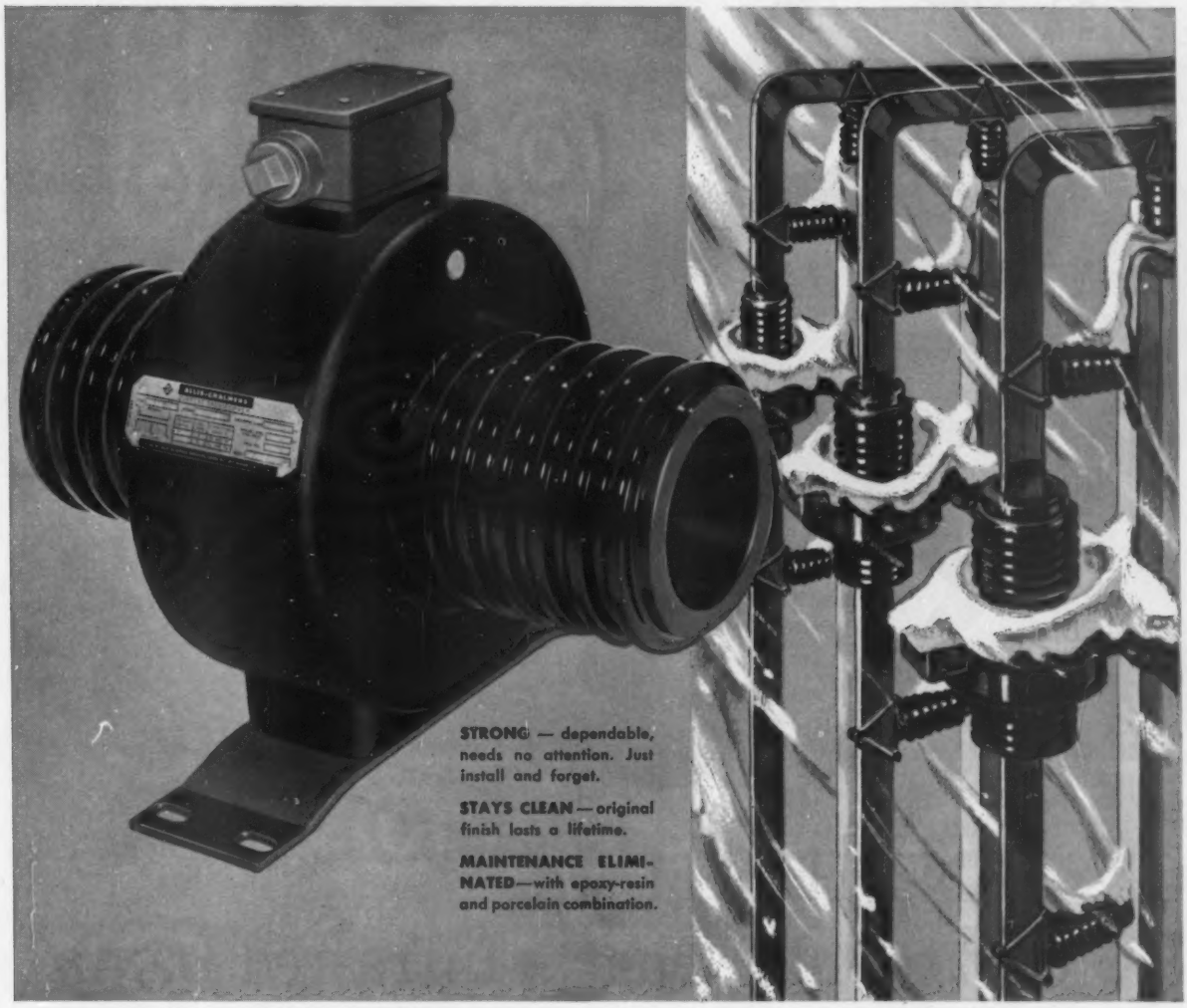
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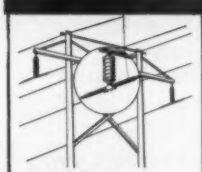
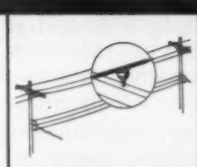
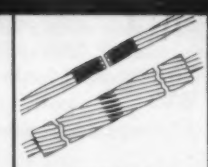


ARMOR RODS
. . . Protect long spans at supports



LINEGUARDS
. . . Protect short spans at supports

FANNGRIPS
. . . For dead-ending strands or conductors



FANNSPLICES
. . . For joining or patching strands

TREEGUARDS
. . . Protect conductor surface covering

KOVER-GARDS
. . . Protect surface-mounted conductors

*A superior forming method in accordance with Patents No. 2,769,478 and 2,588,663—other patents applied for.

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A-3635A

CIRTUBE EMT is the one on top

Shown here unplated

The other one is ordinary EMT that failed early in a pressure test. CIRTUBE EMT held up far beyond UL requirements. The reason: *continuous induction welding*, by far the best technique for making *bead-free, split-free* welds on high quality EMT.

The benefit: your men get easier, neater bending without kinking or flattening—and they get it right the first time around. Add easy fishing, a good-looking, life-time finish, easy-handling bundles and fast, friendly service—and you'll know why more and more contractors are specifying CIRTUBE EMT.

Ask for it on your next job—you'll like working with it.

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Rubber Covered Wires & Cables • Varnished Cambric Cables • Plastic Insulated Cables • Neoprene Sheathed Cables • "CIRTUBE" EMT

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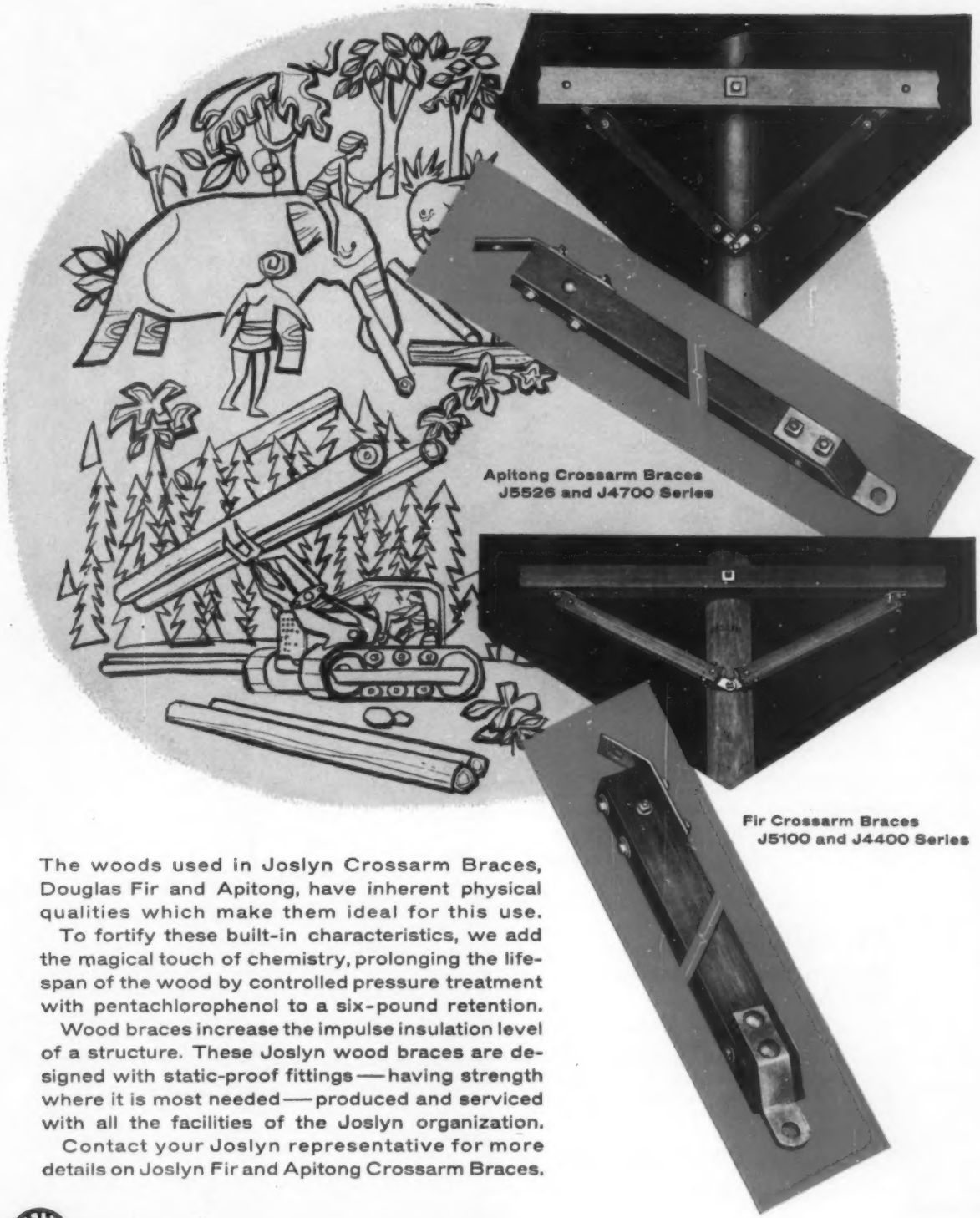
from the Pacific Northwest to Malaya to the Philippines



Apitong Crossarm Braces
J5526 and J4700 Series

Fir Crossarm Braces
J5100 and J4400 Series

The woods used in Joslyn Crossarm Braces, Douglas Fir and Apitong, have inherent physical qualities which make them ideal for this use.

To fortify these built-in characteristics, we add the magical touch of chemistry, prolonging the life-span of the wood by controlled pressure treatment with pentachlorophenol to a six-pound retention.

Wood braces increase the impulse insulation level of a structure. These Joslyn wood braces are designed with static-proof fittings — having strength where it is most needed — produced and serviced with all the facilities of the Joslyn organization.

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AT RENO . . .

two MU-60 peaking plants

Two Electro-Motive MU-60, 6000 KW, Peaking Plants are installed back-to-back at Reno—first such installation in the country. This installation illustrates the building-block capabilities of the basic Electro-Motive Plant design.

AT CARSON CITY. . .

peaking plant in place in 19½ hours

The third Sierra Pacific Peaking Plant, installed at Carson City, demonstrates the high mobility and flexibility of the Electro-Motive equipment. Starting at 8:00 a.m., on October 3, the Electro-Motive MU-60 scheduled for Carson City was loaded from rail cars onto low-boy trailers for the 35 mile trip to Carson City. By 5:00 p.m., the following day, all equipment was unloaded and placed in position.

To meet winter peak demands . . .

SIERRA PACIFIC POWER CO. ADDS THREE ELECTRO-MOTIVE PEAKING PLANTS

The Sierra Pacific Power Company is meeting anticipated 1960-61 Winter peak demands with 18,000 KW generated by two new 6,000 KW Electro-Motive Peaking Plants installed at Reno, and a third plant installed near Carson City, Nevada.

PEAKING POWER COMES FIRST— Base load power supply on the Sierra Pacific system is purchased from Pacific Gas and Electric Company and is transmitted across the Sierra-Nevada range from Summit substation 40 miles west of Reno. In addition, Sierra Pacific Power Company supplements this base load with four small hydro plants with about 9,000 KW capacity. With the addition of the three Electro-Motive Peaking Plants, Sierra Pacific is putting peaking power first, in their six year plan of system expansion, to meet load growth and peak demands.

Sierra Pacific expects winter peaks on the system ranging up to 136,000 KW during the months of November through February. Peaks will occur between 5:00 and 7:00 p.m., and will require Peaking Plant operation of one to four and a half hours daily.

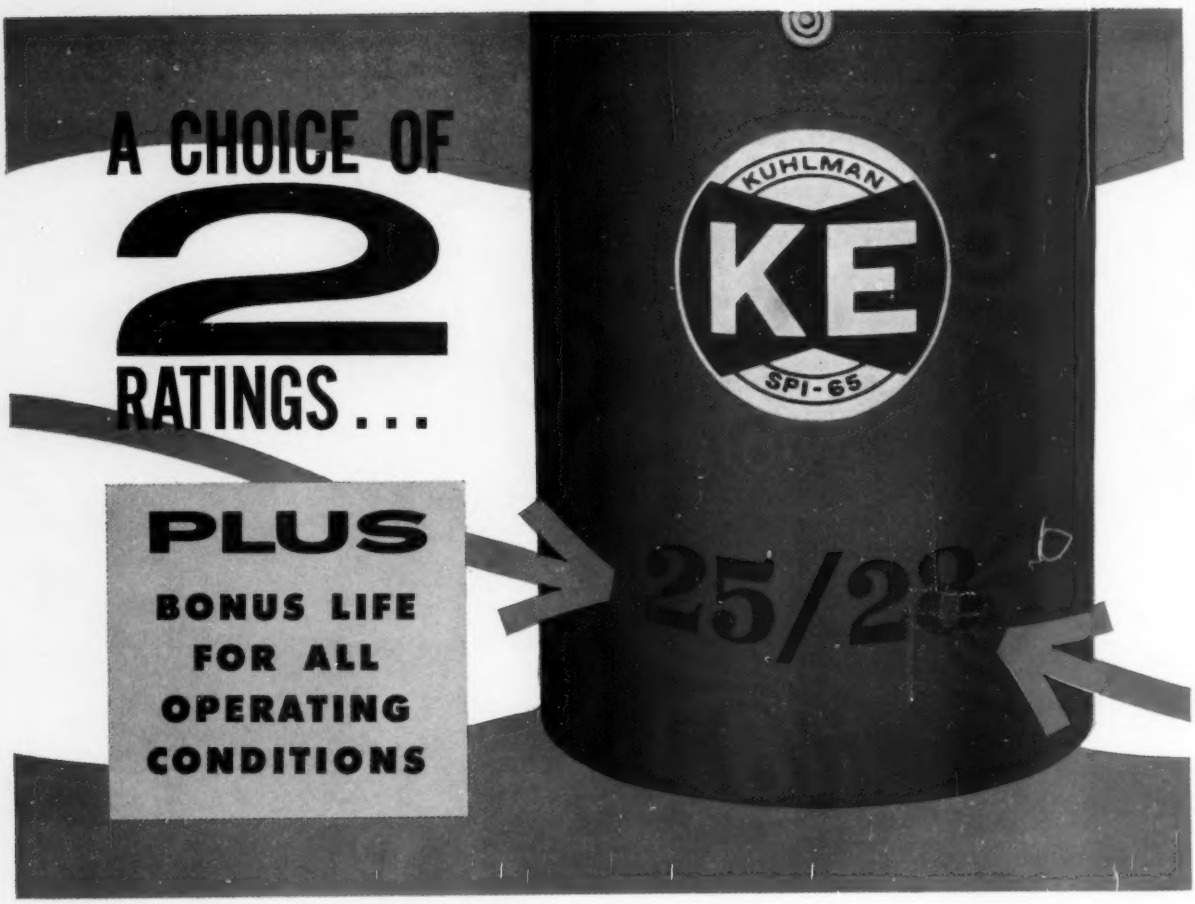
REMOTE CONTROL OPERATION—The Electro-Motive Peaking Plants are remotely controlled from the system dispatch center at Reno. The dispatch center is located 35 miles from the Carson City installation and three miles from the Reno Peaking Plants. Remote supervisory control allows the Peaking Plants to start up, synchronize, go on the line and operate unattended. Output of the units is fed directly into a bus through a transformer connected to the system base supply.

ECONOMICAL PEAKING POWER—The total installed cost of the three Sierra Pacific Peaking Plants (including site preparation and all auxiliary equipment) was below estimate, and considerably below the cost of base load generating equipment designed to do the same job. Decentralized Electro-Motive Peaking Plants were the lowest cost solution to Sierra Pacific's immediate problem.

For complete information on how Electro-Motive Peaking Plants can solve your system problems, ask your Electro-Motive Representative.

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS La Grange, Illinois

Offices: Chicago, New York, St. Louis, San Francisco
In Canada: General Motors Diesel Limited, London, Ontario



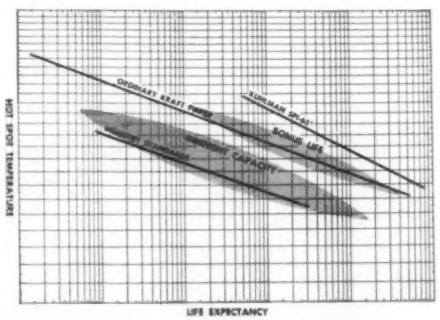
With Kuhlman you get a choice of two ratings (for example, 25KVA and 28KVA as shown above) and super insulation for longer than average operating life. Here are the facts.

First, thermal aging tests proved conclusively that Kuhlman uniform cooling and excellent thermal characteristics provide ample capacity for 12% more KVA per transformer within ASA-NEMA 65° maximum hot spot temperature.

Since extra capacity was inherent in Kuhlman design, it was a simple matter to uprate 12%. Tests also proved that SPI-65*—an improved, special treated insulation—was superior under all transformer thermal conditions to the standard kraft insulation used in most transformer design.

So don't sacrifice one for the other. Kuhlman gives you both—12% overload and longer than average operating life. Because Kuhlman offers capacity to spare, *plus* bonus life insulation. Don't settle for anything less. Order SPI-65* transformers direct from stock from your local Kuhlman representative and get bonus life for all operating conditions.

Licensed under Westinghouse Insuldur patent rights.



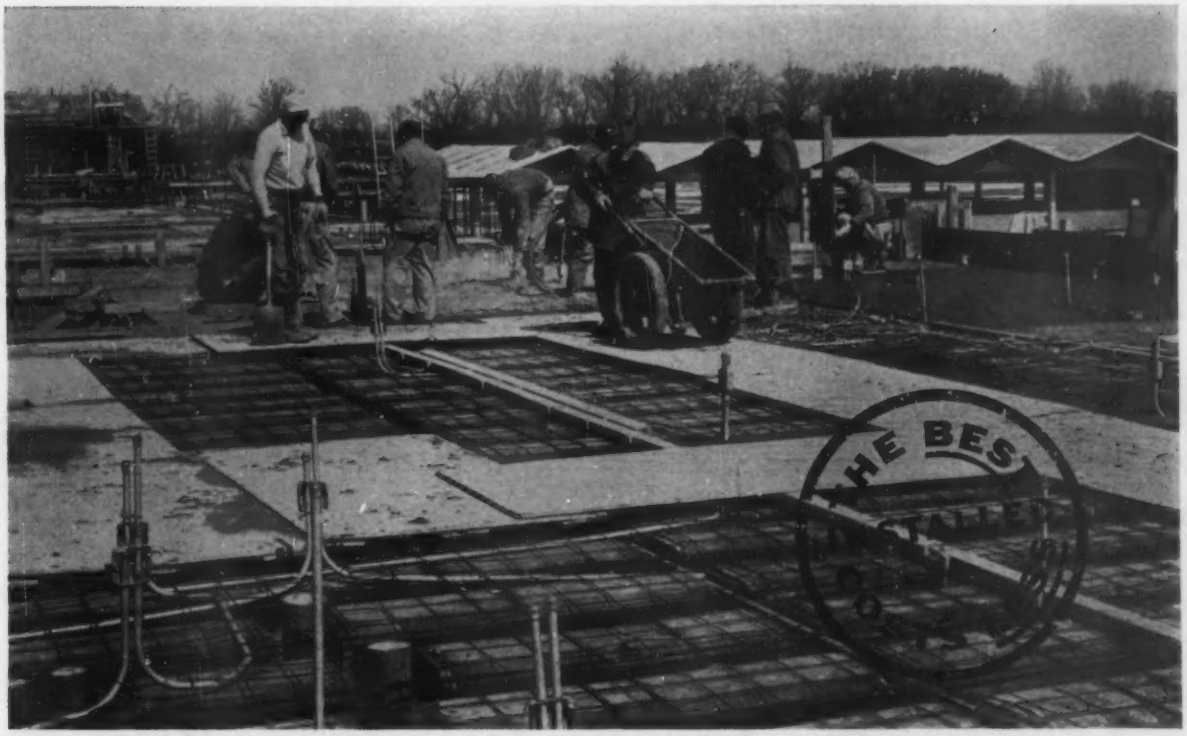
This life versus temperature test chart shows the inherent capacity and bonus life of Kuhlman transformers.

KUHLMAN TRANSFORMERS

Manufacturers of transformers since 1894

KUHLMAN ELECTRIC COMPANY, Birmingham, Michigan

Southern Division: CRYSTAL SPRINGS, MISSISSIPPI



Maryknoll Junior Seminary, St. Louis County, Missouri
Architects and Electrical Engineer: Leo Daly Co., St. Louis, Mo.
General Contractor: Gamble Construction Co., St. Louis, Mo.
Electrical Contractor: Kaemmerlen Electric Co., St. Louis, Mo.

St. Louis contractor praises

"Definite Savings" of Republic ELECTRUNITE E.M.T.

(ELECTRICAL METALLIC TUBING)

Kaemmerlen Electric Company used Republic ELECTRUNITE E.M.T. exclusively for all raceways in the new Maryknoll Junior Seminary in St. Louis County.

Mr. H. Chub Winkelmann, Contracting Department Manager, writes how pleased he is with the results. He reports definite savings because of "your numerous features such as INCH-MARKS, GUIDE-LINES, and easy pulling inside surfaces." Further, he likes the fact that "uniform bending produces a neat and good mechanical installation."

Check Winkelmann's findings yourself. Put ELECTRUNITE E.M.T. to work on your jobs. Exclusive features make installation easier, reduce wasted materials, and let you pocket a profit. Pick up enough bundles from your electrical distributor to run your own tests. You'll find that "The *Best* costs *Less* installed."

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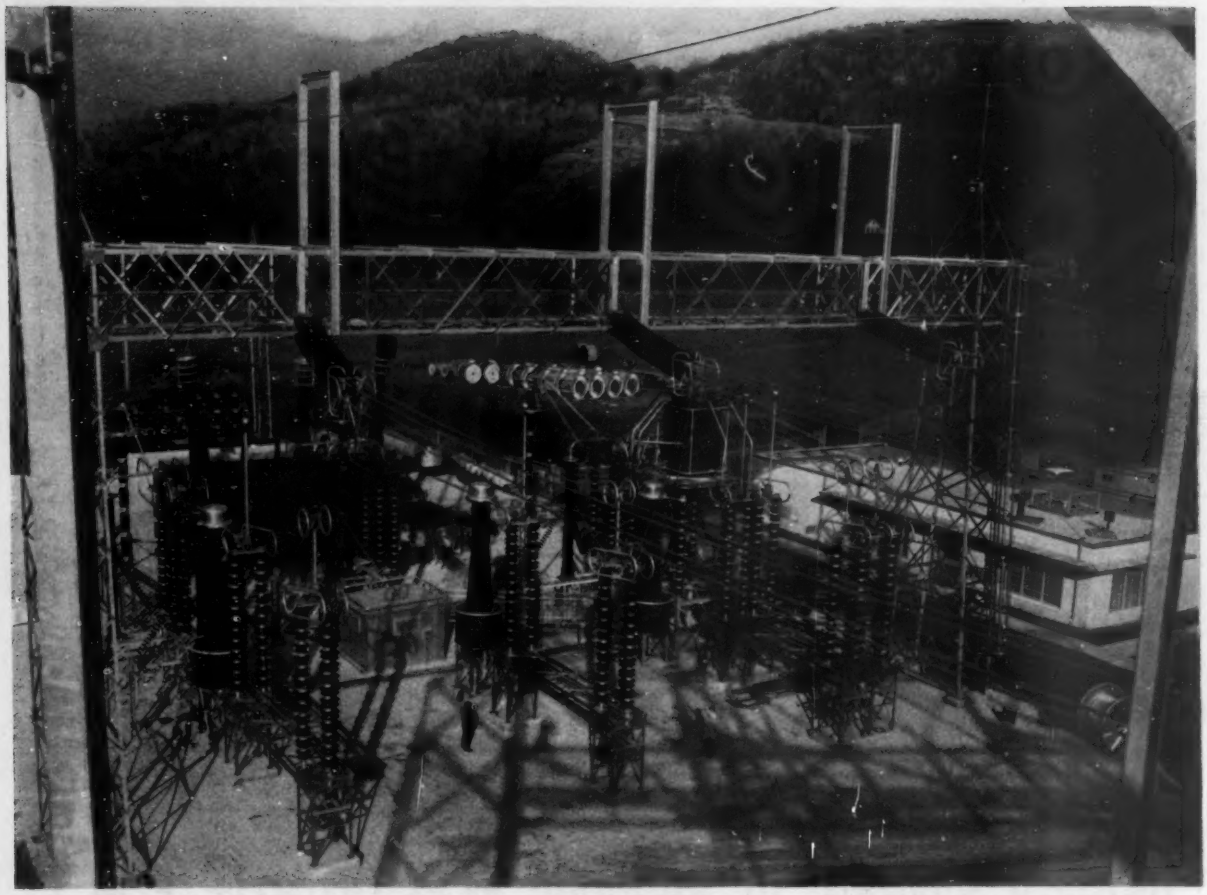


This is the north substation of Project EHV as viewed from portal transmission tower number one. Conductors, bundled and spaced for transmission up to a new world high of 750 kv, are shown in the foreground. Men near the disconnect switches, foreground, illustrate the mammoth size of the project's electrical apparatus.

Project EHV sets line voltage record

The $7,500,000 undertaking has been built to help utilities with problems that will be encountered in constructing future extra-high-voltage lines

◆ General Electric has energized Project EHV (extra-high-voltage) with a new world mark of approximately three-quarters of a million volts.

Project EHV is a 4.3-mile prototype transmission system which will be used to master problems of transmitting electric power at 460,000 to 750,000 volts instead of the 115,000 to 345,000 volts now used. It is in operation to help electric utilities with the numerous problems that will be encountered in constructing future extra-high-voltage lines to answer America's demands for increased power at continued economical rates.

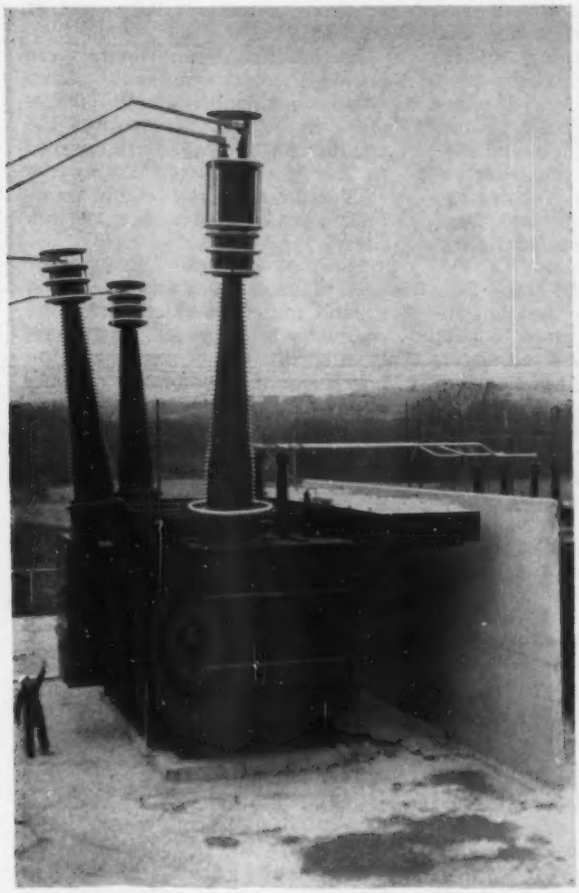
Project EHV is located in the rolling hills of the Berkshires, along the Housatonic River south of Pittsfield, Mass.

The outdoor laboratory is sponsored by the General Electric Company with the help of 12 other companies. General Electric's Power Transformer Dept., Pittsfield, is coordinating the project.

Overall cost will be around $7,500,000. General Electric will contribute more than $6 million and the remaining costs will be borne by the 12 cooperating companies.

The outdoor laboratory will operate for the next few years at a range of 460 to 750 kv.

The north section of the two-section, 4.3-mile prototype system received the record voltage that puts the United States ahead of Russia and other foreign countries



The world's highest voltage power transformer, seen to the left of the concrete wall, steps up incoming voltage to a range of 460 kv to 750 kv at Project EHV.

An aerial view shows the project area. The substation, with its 650-kva power transformer, is in the foreground. The three towers are placed 1,569 and 1,431 feet apart.

as the world leader in extra-high-voltage transmission.

The highest operating transmission voltage in Russia is 500,000 volts. A 0.6-mile experimental line near Leningrad is reportedly testing at 600,000 volts.

According to Dr. Pier A. Abetti, project manager, "Extra-high-voltage is a sensible, economical way to help supply America's need for twice as much power within the next ten years."

He explains that one 750,000-volt line will transmit over 36 times as much power as one 115,-000-volt line. Savings in construction costs, buying expensive rights-of-way, towers, conductors, and apparatus result. This will help utilities offer continued economical rates in the face of rising costs.

The new techniques used at Project EHV were predetermined by extensive analytical studies, computer and model investigations, and laboratory work. They will be verified under actual field operations. If the technology needs correction or refinement, it will be more economical to find out on an experimental line, such as Project EHV, than on a utility's fully constructed, operational system.

Six companies and 15 General Electric product departments have contributed to the newly-completed northern section of the $7,500,-000 project, coordinated by the company's Power Transformer Dept. Six other companies are supplying material for the southern section, due to be completed in mid-1961.

Assistance is being rendered by an advisory council, composed of executives and engineers from 15 United States and Canadian utilities, and a consulting engineers committee, with engineers from 14 consulting engineering firms.

Two-hundred sixty-seven measurements of 47 types are being performed: 133 electrical of 13 types; 71 mechanical of 11 types; and 63 meteorological of 23 types.

Being measured are radio and television influence, voltage surges and current, axial tension, maximum angle of swing, amplitude and frequency of aeolian vibrations, temperature, wind velocity and direction, lightning, and corona loss.

Forty - foot lightning rods mounted atop the transmission towers will attract nearby lightning strokes that would otherwise narrowly miss the line. Later, an impulse generator will send man-made 3,000,000-volt lightning bolts to the line.

Instruments will feed information to a General Electric type 310 data acquisition computer. It will gather and record measurements at 20-minute intervals in fair weather and two-minute intervals in foul weather. This averages out

to ten readings per hour, 24 hours a day, seven days per week, for a total of more than 10,000,000 annual readings.

At Project EHV's terminal building the data is recorded on paper tape, converted to magnetic tape, and processed in a 705 computer to provide technical information in the form required for analysis.

The project draws power from a nearby Western Massachusetts Electric Company 115,000-volt line. Disconnect switches completely isolate the station when necessary, while coupling capacitors provide potential for relaying and metering the voltage to a 40,000-kva regulating transformer that covers in 72 steps the entire voltage range under study.

Connection is then made to the world's highest - voltage power transformer, built by General Electric and rated 650 kv, 1,925 BIL. The voltage is brought out through the top of what are believed to be the world's largest high-voltage bushings, rated 2,050 BIL.

The conductors, supplied by Aluminum Company of America, will be tested at 460 kv with spacings of 20, 30, and 38 feet, and at 750 kv with spacings of 45 and 50 feet.

Single 2.32-inch, 2,995-mcm conductors, as well as bundles of two Plovers (1.465 inches, 1,431 mcm) and three Cardinals (1.196 inches, 954 mcm) will be tested at 460 kv. Three Plovers and four Cardinals will be used at 750 kv.

Each conductor phase is held below the transmission towers by two strings of from 26 to 40 insulators, ranging 20 to 30 feet in length. The insulators can withstand a strain up to 36,000 pounds.

Corona shields and various pieces of line hardware are supplied by Brewer Titchener Corp.

The three portal transmission towers, designed by American Bridge Division of United States Steel, are the largest of their type. Tower number two weighs 134 tons, is 128 feet high and 182 feet wide. Towers one and three are somewhat smaller. All three rest on sand that has been firmed by explosives.

Conductor stringing

Stringing the conductors the 1,469 feet from tower one to tower two and 1,531 feet from tower two to three consumed 77 hours, many times that required for normal tension stringing. However, special care was necessary to maintain proper wire sag, hold wire tension nearly constant, and insure that the conductors wouldn't hit the ground and thus bring about corona losses due to frayed edges. The work of erecting the conductors, as well as designing and constructing the entire line, was supervised by Stone & Webster Engineering Corp. Peterson Engineering Company supplied the tension-stringing equipment.

Approximately eight hours were required to prepare the tension-stringing equipment used to keep the conductors from dragging along the ground between towers. When conductors are nicked or when they pick up leaves or dirt, corona loss increases.

A pulling or stringing tension of between 15,000 and 16,000 pounds kept the conductors 20 to 25 feet off the ground at midspan during the 42 hours necessary to string all three phases the 1,569 feet from tower one to tower two and the 1,431 feet from tower two to tower three, a total of 9,000 feet of conductors.

An additional nine hours were required to clip-in each phase. Grips were applied about 150 feet out from each tower to hold the conductor while ends were lowered to the ground. After cutting the conductors to proper length, terminals were applied with a 200-ton press.

Two 32-insulator strings for each phase were assembled on the ground and then raised with the conductor into position. The usually difficult job of removing the grip from the conductor was facilitated by a boom truck.

Final sags of 46 feet (at 68 F) required a completed tension of 20,300 pounds for the span from tower one to tower two and 22,000 pounds for the span from tower two to tower three. This was an extremely taxing job because the turnbuckle, used for final sagging, could only be turned after the con-

(Continued on page 100)

TVA builds seven-mile EHV section

By Warner Ogden, Electrical South Field Editor, Knoxville, Tenn.

◆ Extra-high-voltage lines may be built in the South. A seven-mile section of 460,000-volt transmission line is being built in middle Tennessee by the Tennessee Valley Authority to gain experience in designing and building lines of extra-high voltage.

This project is part of a transmission line for operation at 161,000 volts being constructed from TVA's Johnsonville Steam Plant to Lawrenceburg, Tenn.

While the experimental section is insulated for 460,000 volts, it will be operated at first at 161,000 volts. The estimated cost of the experimental section is about $100,000 per mile.

TVA says that in view of the increasing load on its system, it may be necessary in the future to transmit power from the large steam plants at levels higher than the present top transmission voltage of 161,000.

The experience gained in building the 460,000-volt line will be "valuable in planning the most economical combination of transmission and generation facilities for future power supply in the TVA area," according to a TVA spokesman.

The 460,000-volt line is about twice as large in every respect as any other line TVA has built, except for the height of the steel towers. The towers, which are held as low as practicable to minimize lightning attraction, are about 100 feet high. The cross arms supporting the conductors are 86 feet long. Each of the towers weighs about 12 tons. The insulator strings are 15 feet long.

There are nine cables strung between the towers instead of the usual three. Each of the three large conductors usually seen on transmission lines will be made up on this 460,000-volt line of three 1.2-inch diameter aluminum-and-steel cables strung 18 inches apart in triangular configuration. The nine cables will average about six tons for each span between the towers.

After the cables are strung between the two towers, linemen will ride small cable cars along them to fasten them together in the triangular configuration.

O. A. Waldrop, chief of TVA's power construction in the central area, is supervising erection.

Application of lightning arresters

First of two articles discussing the application of arresters to stations and substations to prevent interruption of service

By H. O. Stoelting, Development Engineer, Line Material Industries, Milwaukee, Wis.

◆ Lightning is the greatest cause of service interruption on systems that are not protected against lightning and are located in areas where storms are frequent.

Involved in the problem of service interruption is the fact that outages caused by lightning tend to be of long duration. This is because of the frequent necessity of replacing damaged equipment.

Merely placing arresters in stations or substations does not mean that the equipment is adequately protected. Unless the lightning arresters are properly selected and placed, protection may be limited.

Considerable study is necessary in order to make the most effective use of insurance expenditure for lighting protection. The amount of study warranted, of course, will depend upon the size and importance of the apparatus being protected.

A complete and detailed study of lightning arrester application is complex and lengthy. Fortunately, the procedure of arrester application to stations and substations can be separated into a number of steps. In the following discussion the broader aspects of these several steps will be briefly reviewed.

Arrester voltage ratings

Selection of the proper voltage rating for the circuit voltage at which the arrester is to be applied is the first important step in application. Arresters with ratings that are too low will give excellent lightning protection to equipment. However, the risk of arrester failure accompanied by service interruption is high. The selection of arresters with ratings that are too high will give a lesser degree of lightning protection. Keep in mind also that the expense of the higher voltage arrester will be greater than that of the proper rating.

Arrester voltage ratings designate the maximum rms 60-cycle voltage that may be applied to the arrester during discharge of a surge current, with assurance that the arrester will properly interrupt power follow current from the system.

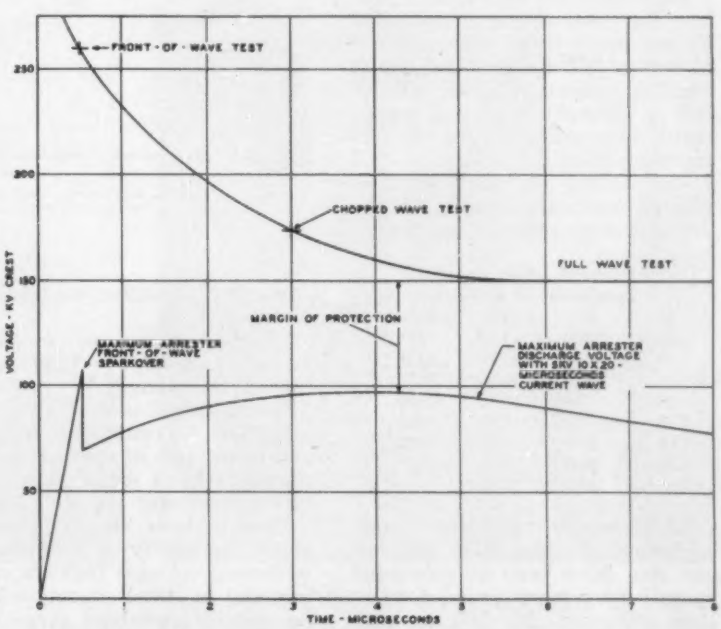
Since lightning arresters are generally applied from line to ground, the line-to-ground voltage of a system is the most important factor in selection of arrester ratings.

System line-to-ground voltage, of course, is dependent upon the operating voltage level. Use of the system nominal voltages in determining arrester application is not sufficient; maximum operating voltages at arrester locations should be used. These maximum operating voltages are of particular importance on circuits having tap changing transformers or voltage regulators.

Experience in arrester application has proved that the line-to-ground voltage occurring during faults must be considered. The voltage on the sound phase of a system should not exceed the arrester rating during line-to-ground faults on the other phase or phases.

This line-to-ground voltage during faults is dependent upon the degree of system grounding, that is, whether the system is solidly grounded, grounded through a reactance, or ungrounded.

During system faults, line-to-ground voltages at arrester locations can be most accurately determined by calculations using



Comparison of volt-time insulation strength of 20/34-.5-kv, 150-kv BIL transformers with protective level of 27-kv type SS arresters.

system symmetrical phase-sequence components of impedances. The impedance values for high voltage transmission circuits are generally known from studies conducted on system regulation, stability, and fault currents to determine ratings and characteristics of other equipment.

Impedances of lower voltage transmission circuits and distribution circuits, however, are frequently not known or the arrester applications are so numerous that calculation to determine the proper voltage rating of arresters for such circuits is impossible or impractical. The accompanying tables give recommendations for arrester ratings for such circuits.

These tables are generally based on very broad, industry-wide experience in the application of arresters. Whenever possible, calculations should be used in selecting lightning arrester ratings.

Selecting BIL equipment

The BIL of equipment for distribution and low-voltage transmission circuits has been well standardized. Thus, on these circuits determination of the standard BIL levels is all that is necessary.

The amount of savings realized with reduced BIL's is negligible unless equipment is produced in quantity, as for example with equipment used on 20/34.5-kv distribution circuits.

Equipment for each system voltage, for transmission circuits (115 kv and up) is obtainable with one of several BIL values. Such equipment is generally custom built, so that a substantial saving can be realized in reducing the BIL of the equipment.

The saving in cost becomes greater for reductions in BIL as the operating voltages increase.

Preferred basic impulse insulation levels—kv

30	250	1175	2300
45	350	1300	2425
60	450	1425	2550
75	550	1550	2675
95	650	1675	2800
110	750	1800	2925
125	825	1925	3050
150	900	2050	
200	1050	2175	

High-voltage systems with equipment having BIL reduced one step have been in successful operation for many years. A two-step reduction in BIL is also proving satisfactory. The reduction of arrester protective levels within the past ten years has made a three-step reduction in insulation levels feasible.

The industry is becoming concerned, however, about the switching surge strength of insulation. The characteristics of insulation subjected to continuous voltages and to voltages of microseconds in duration have been thoroughly investigated and are well known.

Very little is known, however, about the ability of insulation to withstand voltages that are milliseconds in total duration. The duration of switching surge voltages are within this questionable time range.

An intensive study of switching surges in power systems is now going on in a number of AIEE technical committees. The Transmission and Distribution Committee is studying the magnitude, wave shape, and duration of the various types of switching surges that can occur.

Other committees are working on switching surge insulation strength and on the sparkover and discharge voltage of lightning arresters. The study of insulation and lightning arresters cannot be completed, however, until the work on wave shape of switching surges is finished.

When lightning arresters are ap-

Lightning Arrester Ratings for Four-Wire, Multi-Grounded, Neutral, Distribution Circuits

Nominal Circuit Voltage – Kv	Maximum Tolerable Zone Voltage – Kv	Percent Arrester Rating Required	Theoretical Arrester Rating – Kv †	Arrester Rating Recommended – Kv §
2.4/4.16	2.6/4.5	67	3.01	3
4.8/8.32	5.2/9	67	6.02	6
7.2/12.47	7.5/12.8*	70	9.0	9
7.2/12.47	7.8/13.5	70	9.5	10
7.62/13.2	8.25/14.5	70	10.2	10
12/21	13/23	72	16.6	18
13.2/23	14.5/25	72	18.0	18
14.4/24.9	14.5/25*	72	18.0	18
14.4/24.9	15.5/27	72	19.5	20
16/27.6	17.5/30	72	21.6	27
20/34.5	21.5/37.5	72	27.0	27

† Based on multiplication of percent arrester rating required by maximum tolerable zone voltage.
§ The closest rating of distribution arrester produced by L-M.
* Maximum system operating voltage for which the given arrester is recommended.

Lightning Arrester Ratings for Three-Wire Distribution and Transmission Circuits

		Solidly Grounded Neutral Circuits			Ungrounded Circuits *
Nominal Circuit Voltage – Kv	Maximum Tolerable Zone Voltage – Kv	Percent Arrester Rating Required	Theoretical Arrester Rating – Kv ‡	Arrester Rating Recommended – Kv	Arrester Rating Recommended – Kv
2.4	2.6				3
4.16	4.5	80	3.6	6	6
4.8	5.2				6
7.2	7.8				9
12	13				15
13.2	14.3	80	11.45	12	15
14.4	15	80	12.0	12	15
23	25.8	80	20.06	20	25
27.6	31.0	80	24.8	25	30
34.5	38.0	80	30.4	30	37
46	48.3	80	38.6	40	50
69	72.5	80	58.0	60	73
115	121	80	96.8	97	121
		75	90.08	90	
138	145	80	116.0	121	
		75	108.0	109	

‡ Based on multiplication of percent arrester rating required by maximum tolerable zone voltage.
* Arrester ratings for ungrounded circuits are 100 percent of maximum tolerable zone voltage.
NOTE: Some arrester ratings are slightly lower than recommended, but this table reflects common practice in arrester application.

plied to stations and substations, switching surge voltages may be a factor in limiting the amount that insulation levels of equipment can be reduced. At present, however, there is insufficient knowledge of the problem to apply insulation limits.

Several values of insulation levels may be selected tentatively for equipment when designing high voltage stations and substations. The most economical level will become apparent when the additional steps in applying arresters are worked out.

The discharge voltage of the arresters selected for protection should be below the BIL of the protected equipment by a suitable margin. This margin can be considered a factor of safety, and it takes into account factors and

(Continued on page 100)

Model aids engineers in line transposition problem

◆ When one of the circuits on the double-circuit Handley-Mountain Creek transmission line was recently re-insulated for 138 kv operation, the engineering department was confronted with an unusual problem. And the solution was as ingenious as it was practical.

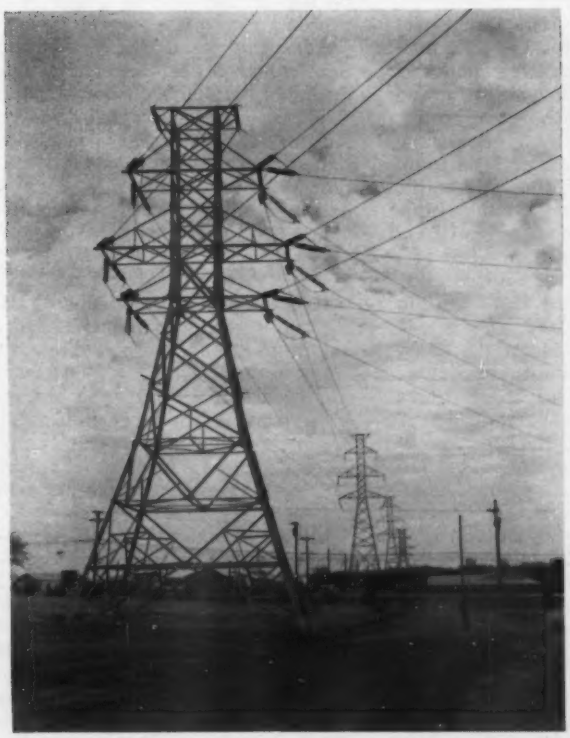
The circuits are on either side of steel towers and interconnect Handley plant and the Dallas Power and Light system near Mountain Creek. The problem came about by the fact that the Handley and Arlington substation layouts required that the 138 kv circuit be on the north, while the structures at General Motors tap and Fish Creek connection required that the 138 kv circuit be on the south.

So, somewhere betwixt and between, the circuits had to be switched from one side to the other —and the crossing of the lines had to be east of the Arlington substation as the 69 kv structure there is south of the tower line.

Bill Fuller and Henry Manning made several preliminary sketches, and because it was the only practical means by which phase clearances could be checked, a miniature model of the four transmission towers involved was constructed and set up in a conference room. Crisscrossing the string in a manner that would have made a puppeteer envious, the two men came up with a solution.

"The problem was simple enough," Mr. Manning explained, "but we were looking for the most practical means of switching the lines without additional pole or tower construction."

The two lines swapped sides within three spans.



Transposing a 69-kv and a 138-kv circuit from one side of a transmission line to the other in a matter of three or four spans presented a tricky problem in clearances between lines and towers.

Henry Manning, left, and Bill Fuller, both of the general office engineering department, of Texas Electric Service Co., Fort Worth, found this small model to be an effective aid in checking results.

Electric utility industry continues

By Sherman R. Knapp, President, Edison Electric Institute.

◆ During 1960, a year in which the American economy as a whole followed a somewhat uneven path, the electric utility industry continued its record-making growth, substantially advancing toward the level of power-producing capability expected by the end of the decade.

By 1970, investor-owned electric companies plan to have doubled their present capability and their production. By 1980, they expect both capability and production to be nearly quadrupled.

According to preliminary figures, electric energy output (including imports from Canada) by the total electric utility industry in the contiguous United States (i. e., exclusive of Alaska and Hawaii) is estimated to have reached a record high of 764.8 billion kilowatthours during 1960, an expected increase of some 45.3 billion kilowatthours, or 6.3 per cent over 1959.

With the addition of the electricity generated by industrial plants and by railways not contributing to the public supply, and of generation in Alaska and Hawaii, the United States' output is expected to have reached a record total of 850 billion kilowatthours in 1960.

Production of electricity within the United States (including Alaska and Hawaii and excluding imports) reached a record high of 845 billion kilowatthours.

Capability at new high

In December of 1960 the power-producing capability of the electric industry in the contiguous United States is estimated to have reached a new high of 175.9 million kilowatts. This was an increase of 12.6 million kilowatts, or 7.7 per cent, over the 1959 figure of 163.3 million kilowatts.

Of the industry's total of 175.9 million kilowatts of capability, 134.0 million kilowatts, or 76.2 per cent, were provided by investor-owned companies. The remaining 41.9 million kilowatts, 23.8 per cent of the total, were provided by government-owned or government-financed power agencies.

The nation's total electric generating capability, including railway and industrial plants not contributing to the public supply, is estimated to have reached approximately 193 million kilowatts, an increase of some 13 million kilowatts over 1959. Including Alaska and Hawaii, total capability available to the United States is estimated to be about 193.9 million kilowatts.

With an estimated annual peak demand in 1960 of over 139 million kilowatts, the electric industry in the contiguous United States had 35.6 million kilowatts of reserve capability or a 25.5 per cent margin of capability over the estimated annual peak. This margin of reserve was more than the total electric power-producing capability of the nation in the year 1935.

Lead over USSR increased

At the close of 1959 the Soviet Union reported a total of 59.1 million kilowatts in electric generating stations. During 1960, an estimated 7.5 million kilowatts were added, bringing Russia's total generating capability at the end of 1960 to an estimated 66.6 million kilowatts.

Thus, the United States' kilowatt lead over the Soviet Union increased by 6.3 million kilowatts during 1960, from 121 million kilowatts a year ago to 127.3 million kilowatts today.

The amount of electricity used by each person in a nation provides a good indication of the nation's total productive capacity and of the well-being of the people. In 1960, the estimated use was 4,716 kilowatthours for every man, woman, and child in the United States. In the Soviet Union, estimated use was 1,322 kilowatthours per capita.

But the real importance of the continued growth of the American electric industry cannot be measured in terms of an economic race with the Soviet Union. The proper measure of the value of the American electric industry is in terms of the benefits electric service has brought, and will increasingly bring, to the American people.

In maintaining their construction programs at the high level needed to meet increasing demands for electricity, the electric companies brought both revenues and employment opportunities to the many industries and enterprises which supply them equipment and materials.

The companies' total construction expenditures for the year were $3.35 billion, bringing the total investment in electric plant and equipment up to approximately $46 billion at the end of the year.

The electric companies' construction expenditures during 1960 equalled approximately 9.5 per cent of all the construction expenditures of American industry during the year. The companies' expenditures on new plant and equipment during 1960 were their fourth largest in history. For 1961 construction expenditures are expected to increase to about $3.41 billion.

For the seven days ending September 3, the industry produced 14,941,000,000 kilowatthours —setting a new record for weekly output. In this one week, the industry produced some 700 million more kilowatthours than it had generated during the entire year of 1914.

New sales record

It is estimated that sales of the electric industry in 1960 reached a new high of 667.4 billion kilowatthours, classified by customer classifications as follows in billions of kilowatthours: large industrial, 323.5; residential, 188.9; commercial, 114.4; and other, 40.6. This total represents a 6.5 per cent increase over 1959.

Use of electricity in the American home continued to increase during 1960. Of approximately 1.1 million new customers the electric industry in the contiguous United States added in 1960, about 94 per cent were residential and rural customers. Of the total 58.6 million customers served by the industry at the end of the year, approximately 50 million were residential.

On the average, the use of electricity by each of these families was 3,815 kilowatthours—an in-

record-making growth during 1960

crease of 230 kilowatthours over the previous record in 1959.

Gross revenues for all departments of the investor-owned electric companies in 1960 are expected to reach $11.5 billion, 6.5 per cent higher than the former record of $10.8 billion set in 1959.

Taxes

For 1960, it is estimated that the investor-owned electric companies will have a total tax bill on their operations of approximately $2.35 billion—approximately $160 million more than in 1959. These payments are to all levels of government—Federal, state, and local—with the Federal government getting the greatest share.

Had the companies not maintained their record of growth, if their net income had decreased rather than increased, their tax payments would have been lower. Through these tax payments the strength of the electric companies helps supply sinews to the national defense, and contributes to the functioning of government in other essential areas as well.

Paradoxically, these tax payments also contribute to the support of the various government power agencies which are thus able to supply their customers with subsidized, tax-free electricity.

Taxes constitute the electric companies' largest single item of expense. As in any business, these taxes are paid by the consumer: the customer of the electric companies. In effect, the companies are acting as tax collectors for government. During 1960, out of each dollar an electric company customer paid for electricity, 24.1 cents went for taxes.

Customers of government-owned and government-financed power agencies, on the other hand, pay only about 3.5 cents out of each dollar they spend for electricity despite the fact that their electricity is provided with the help of taxes gathered from others.

It seems reasonable to hope that some means can be found for each consumer of electricity to share equitably in the cost of government through his electric bill.

During the year, electric companies provided employment for approximately 340,000 men and women. For 1960, the electric companies paid out in wages and salaries close to $1.6 billion, an estimated increase of 3.9 per cent over the 1959 figure of $1.54 billion.

The nation's electric companies purchased about $1.48 billion worth of coal, oil, and gas during 1960, about 4.2 per cent more than the $1.42 billion spent for this purpose in 1959.

The problems of rising costs for the electric companies have been widely recognized by the regulatory agencies. The commissions continue to recognize the effects of inflation in practically all aspects of operational and capital costs, and the necessity for the financial strength essential to the provision of adequate electric service.

From 1946 through the first 11 months of 1960, according to tabulations of the Edison Electric Institute, there were 597 applications for rate increases involving 226 companies. Of these 597 applications, 536 were granted, 24 are pending, 13 were withdrawn, and 24 denied.

The 1960 record to December shows 32 actions. Twenty increases were granted, one was denied, and 11 of the 1960 applications are still pending. However, because of the sliding scale nature of the rates the average price per residential kilowatthour sold in 1960 was less than it was in 1959.

Predictions for 1961

For 1961, the electric companies plan to expend about $3.41 billion for new plant and equipment. During the year, they plan to add about 7.5 million more kilowatts of generating equipment. Governmental agencies are expected to add another 3.8 million kilowatts during the year. The expected capability for the total industry in the contiguous United States at the end of the year is 187.2 million kilowatts, 6.5 per cent over the 1960 figure.

By the end of 1961, electricity output in the United States, including Alaska and Hawaii, is expected to be 7.0 per cent higher than in 1960, totaling some 910 billion kilowatthours. Sales by all parts of the industry in the contiguous United States are estimated to reach a new peak of 715 billion kilowatthours, 7.2 per cent over the 1960 record.

The number of customers is expected to increase to 59.8 million by the end of the year. The investor-owned companies should increase their revenues by about 6.8 per cent over 1960, reaching $12¼ billion for 1961.

Growth of these proportions is not achieved without effort. As in the past, the electric companies expect to encourage growth in every way possible. Increased sales efforts in the industrial, commercial, residential, and rural areas play a large part in the companies' plans.

One hundred forty-two companies have joined together to take part in the Live Better Electrically Program of the Edison Electric Institute. This national advertising program will have a budget of $2.6 million in 1961.

It will vigorously promote residential use of electricity, with emphasis on the Medallion Home and on the use of major electric appliances. The use of electricity on the farm is to be encouraged through a series of advertisements in major farm journals.

During 1960 the electric companies' program for development of nuclear power made substantial gains. The nuclear power station of the Commonwealth Edison Company—Nuclear Power Group began commercial operation in Dresden, Ill., during the year. This 180,000-kilowatt station, completely financed through voluntary investment, is the largest atomic plant in the United States.

The Yankee Atomic Electric Co., made up of 11 New England electric companies, completed and put into operation a 136,000-kilowatt nuclear power plant located at Rowe, Mass.

Including the two plants which began operation during the year, five electric company nuclear

(Continued on page 97)

Sangamo power capacitor seminar

System measurement methods and capacitor control technique occupy discussions at conference for utility engineers

◆ The annual workshop seminar on power capacitors, conducted recently by Sangamo Electric Co., turned its attention this year to measurement and control in the application of power capacitors.

With a representative group of electric utility engineers and Sangamo personnel present, and with Dr. E. T. B. Gross, of Illinois Institute of Technology, as moderator, the seminar occupied three full days and presented comprehensive data on capacitor application. It was held in Springfield, Ill.

Dr. Gross opened the seminar with a discussion of the how, where, and when of power capacitor application.

"Today," Dr. Gross told the group, "most loads include poor power factor small motors—one can easily find 20 to 30 small motors in an average American home—the lines are longer, the operating voltages higher, and there are many more transformers on the system. All this means the need for more reactive, magnetic fields producing kvar which must be generated somewhere.

"We used to get the kvars from the power plant, together with the kw, and carried it to the load. However, this has been found to be too expensive and uneconomical, since we are able to transmit and to distribute much more power, with the same amount of useful current, over the same lines without an increase of the losses. We see then that the greatly increased kvar demand can best be met by physically separating power generation and reactive power generation."

Dr. Gross also pointed out that voltage control problems today make it less feasible to send reactive power out over the power lines. The salient component of the voltage drop is the out-of-phase component of the current, the part which carries the reactive power. Thus voltage conditions can be improved by supplying the out-of-phase current directly at the load or from nearby sources.

Planned system measurement

The importance of planned system measurements in connection with power capacitor applications was discussed by C. A. Mast, of Central Power and Light Co., Corpus Christi, Texas.

"It is impossible to apply power capacitors to their greatest advantage unless we know the location and magnitude of the reactive load," Mr. Mast said. "How much money can be spent in obtaining this information must now be decided. A rigorous economic evaluation and proof of this could theoretically be made by balancing the cost of the metering and processing of information against the savings in capacity and energy due to properly locating the capacitors. From a practical standpoint, however, I don't know that this has ever been done, or could accurately be done.

"Like a number of problems of this nature, the policy that is followed must be a result of judgment by those who through experience in operating and designing a utility system decide how much information is necessary and what is to them a reasonable expenditure for the information. A program of this type will be designed to take advantage of the particular system organization, operating procedures, and personnel available. It will vary a great deal with the system involved....

"Since we have long transmission lines, we have used capacitors for many years to reduce the need for transporting any great amount of reactive for long distances. With this rapidly increasing load and the associated reactive requirement, the desirability of locating our capacitors to best advantage made necessary some type of reactive metering at the load points. About 1954 a program of installing graphic kw and kvar demand meters at our larger substations was started. This program has been expanded until today approximately 70 per cent of our load is metered in this way. Generally, this includes all substations of 4,500 kva or larger."

The tests are made with a group of portable graphic demand meters, Mr. Mast explained. The feeder panels are equipped with a standard, permanently-wired test block. The kw and kvar meters are equipped with plugs, making their connection a relatively simple matter. The meters are moved from feeder to feeder during the peak load season, and a chart of from three or four days to a week is obtained on each feeder.

"Our feeder metering program has lived up to all expectations," Mr. Mast reported. "It has given the distribution engineer an accurate and complete picture of his system load. By knowing the load magnitudes and characteristics, we have been able to fit controls to our switched capacitor banks....

"Our system uses bus regulation at the substations. We are now able to use daily switched capacitor banks to greater advantage in conjunction with our bus regulation and hold voltages to a narrower band. This will lead to increased feeder loading and a reduction in the number of feeders."

Automatic data processing

One of the most informative discussions of the seminar was presented by I. H. Peak, of Sangamo, who described several systems of automatically recording and processing system measurement data.

As a preliminary to his discussion of automatic data recording and processing systems for electric utility systems, Mr. Peak first out-

lined some of the limitations encountered in connection with manual logging and data reducing systems. Some of those mentioned were lack of control over time of measurement, human errors in reading instruments, the trend toward unattended stations, and the high cost and inaccuracies of such systems.

The ideal system described by Mr. Peak involved automatic logging from supervisory control. Equipment is now available, he reported, for addition to existing supervisory control installations for the logging of parameters telemetered to the central control point. At present, the major suppliers of supervisory control provide an electrically typed log sheet output with the time of the measurement and the reading in engineering units listed against a point identification number. There is no reason why the exact same data could not be provided in the form of punched cards or punched paper tape in addition to the typed log sheet output. This type of data is subject only to the errors inherent in the measuring and telemetering system, and is far superior to that resulting from manual logging.

For substations not equipped with telemetering and supervisory control, it would be possible to install the type of data logger presently used in generating stations for the recording of temperatures, pressures, and electrical quantities. In all three of the possible approaches to this method, high speed data logging, low speed data logging, and telemetering to a central data logging point, the cost would appear to be prohibitive.

In Mr. Peak's opinion, the practical solution will be found only when the problem is approached from the standpoint of the required result rather than that of best utilizing existing "hardware."

For example, he explained, the conventional data logging systems are based on the recording of instantaneous type instrument readings, whereas for system and distribution planning integrated values of amperes, watts, and vars are needed.

An approach to automatic recording and processing of system measurements which produces integrated values directly at the transducer offers tremendous possibilities for simplification and economy of the data logging system. Such an approach is feasible through the use of the thermal demand transmitter and integrating induction meters.

The thermal demand transmitter, called TDT for short, has been used by utility companies for many years where the end result was a chart produced by a potentiometer type recorder. The thermal demand transmitter combines the characteristics of the well-known thermal converter with that of the Lincoln meter. The output of this device is d-c millivolts proportional to the time weighted average of the quantity being measured. Fifteen minute and thirty minute thermal demand transmitters are being made available which produce a millivolt output proportional to the fifteen minute or thirty minute thermal average of watts, vars, amperes squared, or volts squared.

Mr. Peak described several substation data logging systems utilizing this type of equipment for which the cost would be about $200 per measurement point including the thermal demand transmitter. The cost of the substation data logger, depending upon features, would vary from $5,000 to $7,500, making the cost per measurement point $50 to $75 for a substation involving 75 different measurement points. These costs do not include the cost of the transducer (in this case, the thermal demand transmitter), one of which is required for each measurement point, representing an additional $100 or so per measurement point.

Mr. Peak indicated that standardized equipment of this nature will make its appearance early in 1961.

Power capacity controls

Describing the application of power capacity controls to the system of the Public Service Electric and Gas Co., of Newark, N. J., R. M. Havourd reported that no fixed or uncontrolled banks of capacitors had been installed since 1953. Of the company's total connected capacity of 605,000 kvars, 380,000 kvars are in switched banks.

Except for a few trial installations, Mr. Havourd said, the capacitor controls installed by his company have been those sensed by voltage, current, or time. The company's experience has indicated that inspection and maintenance of capacitor switching controls is not excessive and presents no particular problem.

Dan McAuliff, of Sangamo, followed Mr. Havourd on the seminar program with a detailed discussion of innovations in power capacitor controls. He discussed time switches, combination time switch and temperature controls, thermal control devices measuring watts, vars, or amperes, and the application of remote supervisory control devices such as the recently developed Pulsadis relay.

The discussions of capacitor switching controls was appropriately followed by a discussion of vacuum switches for capacitor applications presented by Joseph W. Rittenhouse, of Hi-Voltage Equipment Co., division of Joslyn Mfg. and Supply Co.

Severe switching duty

One of the questions answered by Mr. Rittenhouse explained why capacitor switching is considered to impose severe switching duty upon the interrupter switch. The difficulty, he said, lies in the fact that the total electric charge trapped in the capacitor will be very quickly dumped back into the interrupter device if a restrike should occur. The high rate of change involved results in exceedingly high current in the restrike arc and this in turn produces a large amount of energy that must be dissipated by this arc.

Mr. Rittenhouse presented life expectancy data on vacuum interrupters and some specific application suggestions. He reported that there are more than 2,000 individual vacuum contacts in service in the utility industry today.

The individual contacts are used in interrupter units utilizing from one vacuum contact per phase up to as many as eight contacts per phase. Many of these interrupter switches have been in service for more than four years.

The pace of advancement in the art of designing and producing power capacitors has stepped up rapidly in the past few years, J. F. Kuzela, of Sangamo, stated.

"The NEMA organization has been partially responsible for this progress, but improvements in materials and techniques are largely the cause for producing higher quality capacitors," he said. "Great strides forward have been made by the manufacturers of capacitor tissue. Papers are now produced with fewer conducting particles, increased dielectric strength, lower losses, and flatter loss-temperature curves. With the higher quality paper, it is possible to produce smaller and lighter power capacitors without exceeding temperature rise limits set up by the industry.

"Improvements in production techniques, in vacuum drying impregnation, and in testing have also contributed to higher quality capacitors. New concepts in design to remove heat from critical internal areas of capacitor sections have made possible more reliable units. To keep internal temperature down, heat must be conducted to the outside walls of the capacitor case, so that the heat may be readily dissipated to the surrounding atmosphere. This may be accomplished primarily in two ways: by circulation of dielectric liquid, or by direct conduction of heat to the case, or by a combination of each. The lower the internal temperature, the longer life a capacitor will have, particularly if the ambient is well ventilated.

"Undoubtedly, as time goes on, improved materials will become available, new techniques will be discovered, and advancements made in design, that will make possible higher quality power capacitors, at lower cost per kvar rating."

The trends in design of capacitor mounting equipment were discussed by R. W. Tracey, also of Sangamo. All of the major power capacitor manufacturers furnish complete assemblies of a similar nature for pole mounting on distribution circuits, Mr. Tracey said, as well as open type stacked rack assemblies, both large and small for installation on distribution, subtransmission, and transmission circuits; metal enclosed equipments for distribution substations and industrial use; and submersible equipments for secondary networks and primary distribution lines.

"There is nothing mysterious about capacitor assemblies and, indeed where possible, the NEMA standards have achieved a degree of uniformity by specifying mounting dimensions according to the general type designation, that is, inline, stacked rack, etc.

"Such standardization brings simplicity and increased economic benefits to the user. However, these standards cannot possibly cover every detail associated with equipment design and manufacture, so it logically follows that, as stated in NEMA Standards for shunt capacitors, 'details of construction are optional.'

"This option allows for differences such as one might find in the automotive industry—those appointments which distinguish Chevrolets from Fords, Fords from Plymouths, the compacts from the larger versions, and so on."

Mr. Tracey then outlined some of the recent developments in construction features and methods that have proved advantageous to capacitor application. These included weight and volume reductions, use of corrosion resistant metals, improved sealant compounds, welding techniques, and especially the over-all design of the new thin 50- and 100-kvar units that have made possible the new compact assemblies.

System approach

The system wide approach to the application of primary power capacitors was discussed by T. W. Schroeder, of Illinois Power Co. This system involves planning for var or magnetizing reactive supply just as it is common practice to plan for power supply.

Mr. Schroeder pointed out that there is not quite the need for long range forecasting of vars that there is for kilowatts. A kilovar supply shortage in an area of the system evidences itself as low system voltage which can be predetermined by system studies and correction applied on a much shorter-range basis than for a corresponding power shortage.

Also, kilovar planning is complicated by the fact that system metering facilities for measuring kilovar requirements are generally not as complete nor as accurate as those for measuring kilowatt requirements, Mr. Schroeder said, as well as by the fact that open wire lines and cable provide some var supply while open wire lines and transformers can be heavy var consumers. Also, interconnections change from var suppliers to var consumers depending upon the direction and magnitude of power flow.

With the system-wide approach, the system kilovar requirements are reviewed annually by the study of what may be called a "load flow diagram," Mr. Schroeder explained, which includes special readings of system voltage, kilowatt flow, and kilovar flow near the day that the summer peak load is anticipated. Similar readings are taken near the day that the winter peak load is expected.

From this flow diagram, as finally established, it is possible to observe the area or areas of the system in which low voltage is impending or in which the flow of kilovars is unsatisfactory. Particularly, areas of the system which may be depending normally on var supply from outside interconnections can be detected and proper corrective action determined.

The other basic item of information readily available from a study of the system peak day load flow diagram is the area or areas in which load power factor or kilovar requirements are abnormal. It is possible that certain areas will drift toward "low" load power factor, which together with the possibility of excessive supply system I^2X requirements will lead to a deficiency in var supply as evidenced by either low system voltage or excessive var flow from a neighboring area.

Distribution system feeder var requirements are determined by measurement with portable var recording instruments which are connected into test positions on the feeder control panels. By comparison of charts from these instruments with the kva loads determined from thermal ammeter readings either in the feeder circuits or the distribution substation transformer bank, it is possible to determine the quantity of capacitors which should be installed on each feeder to bring the var load within acceptable limits.

Apportioning var supply

It is the normal aim to install fixed or unswitched capacitors on the 4 kv and 12 kv distribution circuits in an amount that will provide unity power factor or slightly "leading" power factor load on the feeder at minimum load time. Switched capacitors are then installed to correct the feeder load to perhaps 97 to 98 per cent lagging during the peak load time. It is not a normal practice to attempt to regulate feeder voltages with these capacitor bank installations.

This procedure, Mr. Schroeder explained, should result in the maximum allowable quantity of capacitors being installed on the distribution system and, practically speaking, closest to the load.

A number of the larger distribution substations have capacitor banks installed on the 4-kv or 12-kv bus through a circuit breaker to switch the bank. These banks range in size from 900 to 6,300 kvar with the maximum amount switched in one step of being 2,700 kvar. These banks were installed on the system largely at a time when system var supply was urgently needed and the banks could be installed more rapidly than any other form of var supply.

(Continued on page 97)

New utility equipment

Busada meter cover

A transparent plastics meter cover — lighter, tougher, and clear as glass — is being marketed by Busada Manufacturing Corp., Flushing, N. Y.

The Busada plastics cover, available for modern meter types, is virtually indestructible. It is high in impact strength and shatter-resistant. It is lastingly resistant to outdoor

weathering — as proved in extensive testing and is totally unaffected by temperatures approaching 200 F.

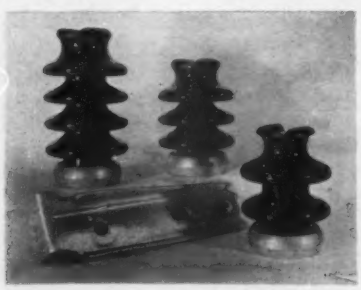
The plastics cover is completely safe in the hands of installation and maintenance men. Because the seal-tight rim eliminates the use of a gasket, it is simple to install.

Write U-101 on reply card, pg. 17

Lapp distribution post

The Lapp Insulator Co., Inc., Le Roy, N. Y., announces a new distribution post insulator rated at 15 kv, matching in characteristics and appearance the 20-kv and 27-kv distribution posts introduced by Lapp six years ago.

The new 15-kv unit, catalog No. 4315A, is a solid, vacuum process



porcelain post cemented into a galvanized steel base and mounted with standard line post studs.

Completely puncture proof (solid porcelain), completely free from radio and television interference without coating, treatment, or attachment, the new post is strong mechanically and rugged against power arcover and mechanical abuse such as stones and bullets. Fog type petticoats provide best operation under contamination conditions.

Write U-102 on reply card, pg. 17

Porter fire-safe cable

A new type of cable that virtually eliminates black smoke and toxic gases in fires has been introduced by the National Electronic Div., H. K. Porter Co., Inc., Porter Building, Pittsburgh 19, Pa.

Called Type K Silicone, the new cable is capable of withstanding temperatures up to 3,500 F, and is unaffected by water.

Insulation of Type K cable is a combination of first-grade, extruded silicone rubber, wrapped with a spiral glass and asbestos tape, and covered with a special braid.

Tests, in which a gas-oxygen mixture subjected the cable to temperatures approaching 3,500 F, produced only a barely discernible white smoke from the cable. The cable did not carry flame even after being placed in the bluest section of the flame for a period of five minutes.

Write U-103 on reply card, pg. 17

Syracuse controller

The PE-601, a solid state photoelectric controller manufactured by Syracuse Electronics Corp., P. O.

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P-W's TYPE "E" (PUNCHED BOTTOM) TRAYS—FOR POWER AND CONTROL CABLES AND INSTRUMENT TUBING—ALTHO LESS EXPENSIVE, ARE STRONGER, VERSATILE AND SUPERIOR. CONTROL CABLE CAN BE DROPPED OUT ANYWHERE.

Engineers, Contractors and Installers look for QUALITY, LONG LIFE, AND LABOR SAVINGS in their supports. That's why more and more users are turning to P-W. Among our outstanding improvements are: CONNECTIONS that are quick and easy to install—PRE-CUT SYSTEMS saving installation time—EXTENSION CONNECTORS eliminating field cutting to complete runs — ADJUSTABLE HORIZONTAL and RISER CONNECTORS to go over, under or around pipes, trusses, columns, etc. — BUILT-IN ADJUSTABLE DROP-OUT SECTIONS eliminate cutting out bottom of tray — STRAIGHT SECTIONS available in lengths up to 16' (33⅓% less connectors and less installation time over 12' lengths).

P-W SUPPORTS are available in hot dip galvanized steel or aluminum, in LADDER, EXPANDED METAL and SOLID TRAYS in addition to Type "E". All systems are interchangeable. Write for Catalog 858-A.

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Box 566, Syracuse 1, N. Y., consists of a transistor amplifier and a power supply packaged in a plug-in unit measuring 2 by 2 by 1½ inches.

The light source and the cell are contained in 2 by 1¼ by ½ inch aluminum housings. The system operates from 115 VAC 50/60 cycles with power consumption of less than three watts total.

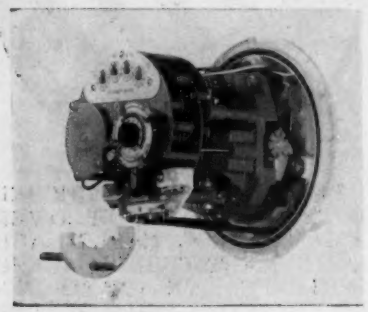
Sensing ranges from portions of an inch to eight feet. Integral sensitivity adjustment provides for a wide range of applications from detecting glass diodes to the detection of transluscent sheets of paper and linen.

Write U-104 on reply card, pg. 17

Sangamo meter-time switch

New meter-time switch combinations with magnetic floating systems are being produced by the Sangamo Electric Co., Springfield, Ill.

These new instruments, designated types J3M and J3V, retain the proven characteristics of the superseded designs and add these new features: a magnetic flotation system, epoxy-



coated current coils, Glaskyd base with polyethylene gasket, and a new spring clip cover ring.

The J3M features a standard kwhr register and a single or double pole, single throw time switch for automatic control of off-peak circuits.

The J3V, designed principally for two-rate billing as well as off-peak circuit control, has a two-rate register which records kilowatthours on two separate dials and is switched automatically.

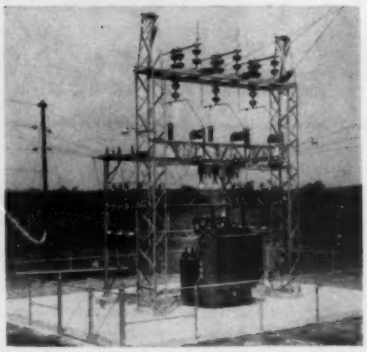
Write U-105 on reply card, pg. 17

A-C Regu/Tran substation

A new concept in substation design which affords utilities greater economies has been announced by Allis-Chalmers, Milwaukee 1, Wis.

Nucleus of the new substation arrangement is the Regu/Tran unit consisting of transformer, regulators, and by-pass switches, surrounded by a steel or aluminum column structure. This compact substation, available with up to four secondary feeders, normal optional accessories, and fence, is economical, small in total area, and simple to install.

The station consists of a two-



column, high-voltage structure with the low-voltage section anchored directly to the high-voltage unit, thereby eliminating two low-voltage columns. The station can handle one incoming three-phase line and up to four outgoing three-phase feeders.

Write U-106 on reply card, pg. 17

Anderson coded connectors

Anderson Electric Corp., P. O. Drawer 2151, Birmingham, Ala., has an exclusive marking system for its new Dura-Squeeze CPH series connectors.

Anderson's Dura-Squeeze aluminum parallel compression connectors are color coded on the connector itself as well as on the carton. This is in contrast to the usual system of marking the connector package or container.

Marked by pressure sensitive labels on the connector, the new color designations offer two primary advantages. Color coding shows at a glance the proper connector to be

used with a conductor. Secondly, since color lines also indicate the number and location of crimps, the lineman can see immediately where to crimp.

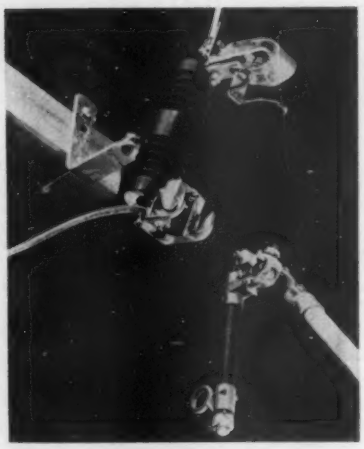
Write U-107 on reply card, pg. 17

S&C fuse tubes, disconnect

Introduction of two new fuse tubes and a new disconnect blade by S&C Electric Co., 4435 N. Ravenswood, Chicago 40, Ill., now permits interchanging any of five different ratings in a single open cutout.

Fully interchangeable in S&C's type XS single-vented cutout are a new 300-amp disconnect blade, a new 200-amp fuse tube, a new 100-amp fuse tube, plus two existing 100-amp fuse tubes. Cutout ratings can be changed as quickly as a lineman can change fuse tubes or blades. Full load switching is available with Loadbuster, S&C's portable load-break tool.

The new disconnect blade is rated 300 amps, continuous. The new S&C



200-amp fuse tube is rated 12,000 amps asymmetrical interrupting at 7.2 kv. The new 100-amp S&C ultra-heavy-duty fuse tube is rated 12,000 amps asymmetrical interrupting, five-shot, and 14,000 amps asymmetrical interrupting, one-shot, at 7.2 kv.

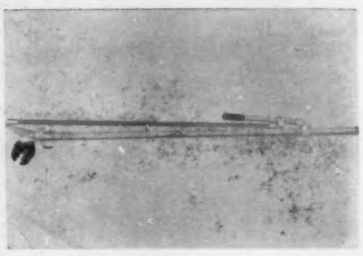
Write U-108 on reply card, pg. 17

Bodendieck hot stick

Bodendieck Tool Co., Rt. 48 N., Taylorsville, Ill., has a new hot stick.

Line crews have frequent need for a high mechanical force lever type hot stick for cutting conductor, and more importantly, for compressing sleeve type splices and the like. This new stick is a standardized design which incorporates an extremely high mechanical advantage toggle system.

Since the dimensions of many compressor heads and cutterheads are very similar, this one hot stick accommodates a wide variety of heads. Therefore, the tool is intended for sale to connector manufacturers on an OEM basis, as well as to power companies for use by line crews.



This tool is particularly handy for crimping hot line splices and for installing compression type stirrups and compression type line repair sleeves.

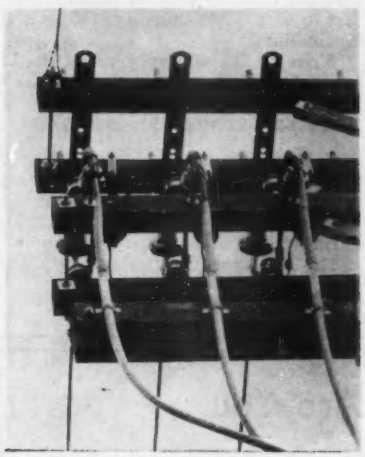
Write U-109 on reply card, pg. 17

Potheadless terminations

The Epoxylite Corp., 10829 E. Central Ave., South El Monte, Calif., announces availability of their cable accessory kit No. 705 for making hermetic potheadless terminations on five-kv paper-lead cable.

Use of the new kit results in elimination of potheads of five-kv cable for both indoor and outdoor service, offering considerable cost saving to utilities.

Cable is prepared in the normal manner. Stress cone may be omitted.



A laminate of special epoxy resin and orlon tape is then constructed by simple, brush-on technique. Laminate extends from lead sheath to terminal ferrule, providing a positive oil-tight, moisture-tight, weatherproof termination. Such terminations have passed all tests specified in AIEE Standard for Potheads, No. 48.

Potheadless terminations prepared in the above manner have been in field service in indoor and outdoor locations for a period in excess of two years with no failures.

Write U-110 on reply card, pg. 17

Conductor safety barrier

An Epoxiglas-insulated barrier, which protects linemen from backing into energized conductors while working on the "cold" side of the pole, has been introduced by the A. B. Chance Co., 210 N. Allen St., Centralia, Mo.

This safety line barrier clamps on the crossarm of double circuit, three-phase, single-pole structures and actually serves as a guard to assist linemen in maintaining a safe working clearance from the "hot" side of the crossarm.

Management Tests Now Show That *Truco* Turret Derrick Cuts Manpower Costs in HALF!

Shown above is a three-stage Truco Turret Derrick with a special 4′ x 6′ aluminum platform recently purchased by an electrical contractor in the western mountain states. With this single unit, this contractor set a series of 90′ poles — each weighing 5,000 pounds including the crossarms, insulators; and all pole hardware in place. After poles were set, placed and tamped, a three man crew (two on spacious platform, one on ground) clipped in the high tension conductors. Not one single lineman climbed a pole during the entire project.

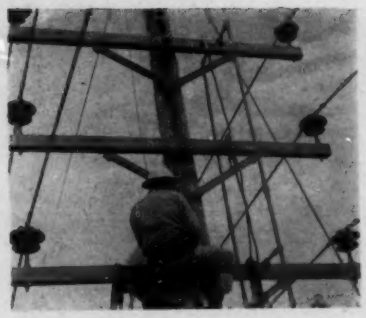
By using one truck mounted combination Truco Turret Derrick and a 3-man crew, this contractor replaced 6 men, 2 vehicles and 4 arm ladders — and did the job safer, faster and surer at a cost savings of more than 50%! This Truco utility derrick tool paid for itself on the first few jobs.

INVESTIGATE the savings *you* can make on *your* aerial jobs — in dollars, manpower and time. See your Truco dealer or write for details.

TRUCK EQUIPMENT COMPANY

"The COMPLETE Line of Utility Equipment"

3963 Walnut Street / AC 2-7905 / Denver 5, Colorado



The bright orange color of the Epoxiglas pole also aids as a visual barrier.

Write U-111 on reply card, pg. 17

Sangamo demand meter

Following introduction of the J3 watthour meter with magnetic flotation, the Sangamo Electric Co., Springfield, Ill., has been rapidly expanding the floating system to their complete line of single-phase and polyphase meters. Now being announced are combination kwh-Lincoln kw demand meters. The new meters are designated type J3T (single-phase) and type PW (polyphase).

J3T integrates the new J3 watthour meter with a single-phase Lincoln watt demand meter. These two separate meters are combined as a single unit, yet have independent current and potential circuits.

True magnetic flotation and many of the other features of the J3 are incorporated in the J3T. Bonded Alnico magnets with opposing fields float the disk. The large magnet gap is visible and self-cleaning. Adjustable pivots, graphite rings, and thrust plates allow exact control of endshake. These components also guide and keep the disk in position under all load conditions.

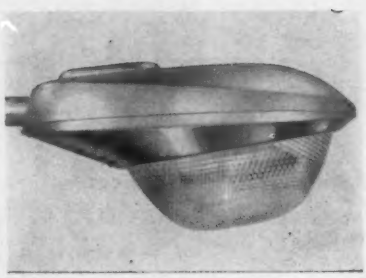
Two pairs of damping magnets balance damping torque to reduce side thrust. The current coil is epoxy coated to provide excellent insulation and heat dissipation characteristics for the entire current coil circuit.

Write U-112 on reply card, pg. 17

Joslyn mercury luminaire

Joslyn Manufacturing and Supply Co., 155 N. Wacker Drive, Chicago 6, Ill., has available its new "400" built-in-ballast mercury luminaire which has successfully withstood wind velocities of 125 miles per hour in actual wind tunnel tests.

In addition, this compact unit utilizes a new concept of mounting



components on a sturdy saddle attached directly to the pipe bracket.

The attractive aluminum housing includes louvers and vent to insure cool operation of electrical components with a 400-watt lamp.

It can be installed with ease by one man due to simple clamping device and lightness in weight — ranging from 22 pounds without ballast to 41 pounds with constant-wattage ballast.

Write U-113 on reply card, pg. 17

Anderson connector insulation

A new self-bonding wrap-around insulation for compression connectors is now being offered by Anderson Electric Corp., P. O. Drawer 2151, Birmingham, Ala.

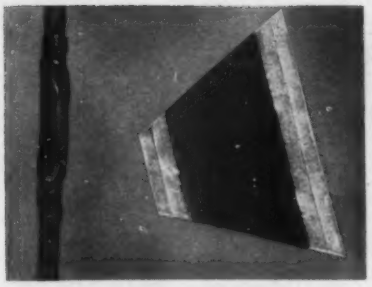
The insulator, "Insta-Seal," is high-

Are You Making Use of Our Reader Service?

The editorial and business staff of ELECTRICAL SOUTH is eager to serve you. One way in which we can help you is to make it easy for you to draw upon the wealth of technical and promotional material available from manufacturers.

In the accompanying pages are the descriptions of scores of useful catalogs, application information booklets, and technical publications. These are available without charge.

Check over the list of publications available, indicate the numbers of the ones you want on the postage - paid card to be found on page 17, and mail it to us with your name, title, company and address plainly written. We will tell each manufacturer to send directly to you the information you want.



ly flexible, non-sticky, and can be applied much faster than tape. The installer simply wraps an "Insta-Seal" pad around a connector, presses the two edges together, and wraps the pad's extended "ears" around the cable entrances to the connector. The pad bonds or vulcanizes itself and also contracts to form a permanent, leak-proof seal.

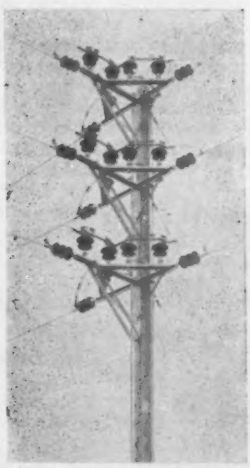
Extensive tests have shown that "Insta-Seal" pads are highly resistant to moisture and other environmental hazards and won't crack or discolor because of changing weather conditions.

Write U-114 on reply card, pg. 17

Royal tap-off switch

Type RG-59 line tap-off switches are made in two and three-way pole units by Royal Electric Manufacturing Co., Inc., Chicago, Ill.

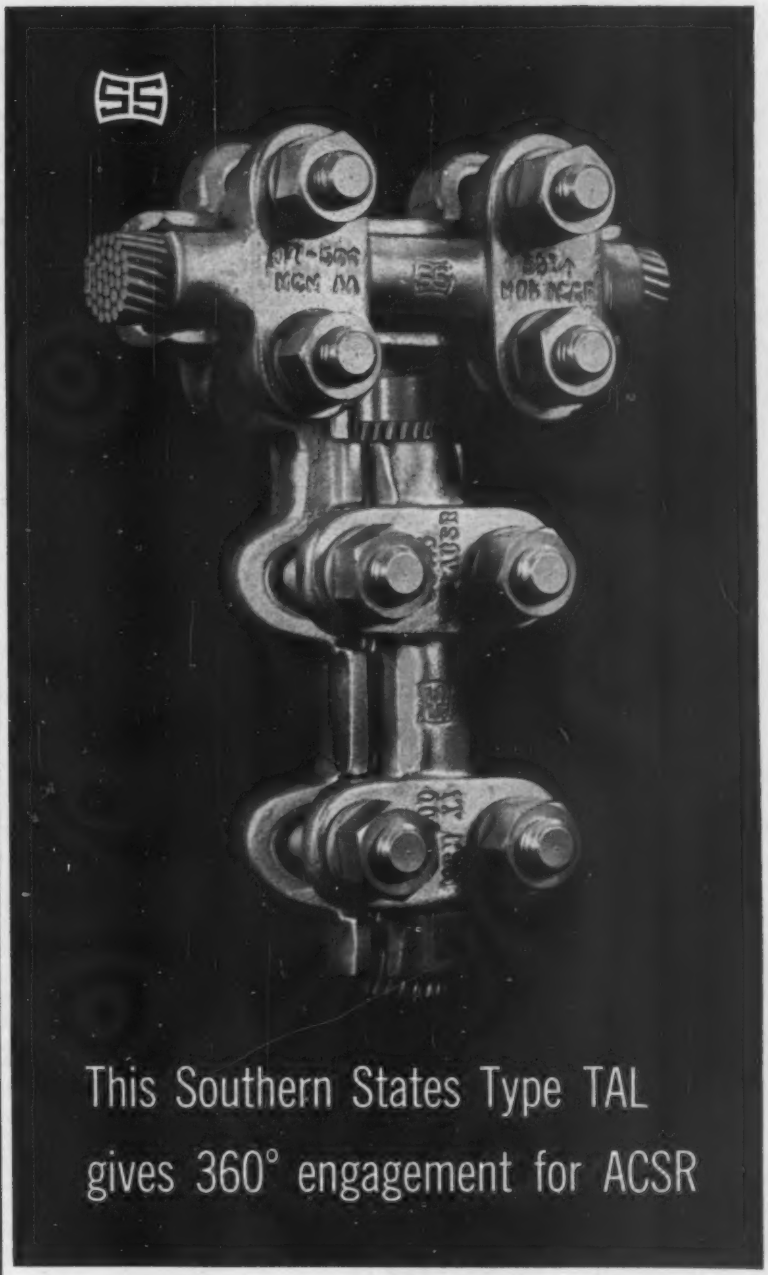
The RG-59 is mounted on a single wood pole with phases vertically separated. The design incorporates a



blade that swings into the open or closed position in one sweeping, continuous movement without lost motion.

Available in ratings of 15, 23, 34.5, 46, and 69 kv at 600 amperes, the RG-59 safely interrupts transformer magnetizing current and line charging current.

It also opens parallel currents, and can be used to sectionalize loop circuits. Due to the vertical phase configuration and single pole mounting,

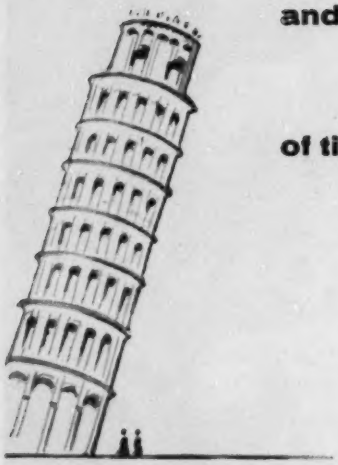


The unique design features of this connector reflect the engineering behind the entire Southern States line of fittings. For instance, to assure good electrical and mechanical characteristics, it provides independent clamping on run and tap conductors; its maximum contact engagement minimizes conductor clamping stresses; and conductor-fitting grooves limit cable distortion.

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA Dominion Cutout Co., Ltd., Toronto

put up an improperly designed photocontrol, and it's also just a question of time.



Apparently no one got a good look at the specs for the Pisa tower — or maybe the mayor was the architect's uncle. Who looks at the specs of the streetlight controls *you* buy and put up in the thousands — and what proof does the vendor offer to back them up? Time will supply the answers, if your source doesn't. The Fisher-Pierce Co., 59 Pearl St., So. Braintree 85, Massachusetts.

FP

FISHER PIERCE

Electrical and Electronic Equipment for Industry, Utilities and the Home

AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

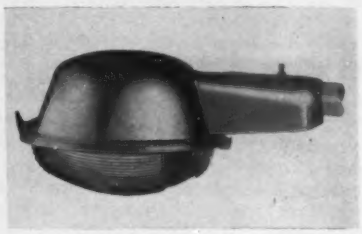
the RG-59 is convenient to install at any tap point.

Write U-115 on reply card, pg. 17

Revere street luminaire

Revere Electric Manufacturing Co., 7420 Lehigh Ave., Chicago 48, Ill., announces the new 2500 series Urbanoval end-mounting street lighting luminaire for residential areas or secondary streets where uniform, low-level lighting is desired.

The Urbanoval is designed for 100-, 175-, or 250-watt mercury lamps or incandescent lamps up to 4,000 lumens. It is the latest addition to a new family of Revere luminaires en-



gineered to meet the varied requirements of different street lighting applications.

The smallest in the Revere family of end-mounted oval mercury luminaires, the Urbanoval provides efficient, low cost illumination.

Write U-116 on reply card, pg. 17

G&W plastic cable sleeve

A plastic cable sleeve installed temporarily over an unfinished joint or termination will keep dirt and moisture from the work overnight or for several days at a time if necessary. Announced recently by G&W Electric Specialty Co., 3500 W. 127th St., Blue Island, Ill., the new sleeve

will seal the exposed joint or termination against moisture and contaminants of all kinds to keep the work as dry and clean as when it was sealed.

The G&W universal protection kit consists of a plastic sleeve long enough to cover the cable joint or termination, waterproof paper to keep the plastic clean, tape, desiccant, and humidity indicator.

Write U-117 on reply card, pg. 17

Know the law

by Arthur L. H. Street

School wiring bids involve controversy

THE PROBLEM: A school district, in contracting for additions to three separate school buildings, let a contract for the electrical work, under invitation to submit separate bids on the three buildings and a combination bid on all three.

Contractor Bana's bid was low on two of the buildings but higher on the third and on the combined proposal. Contract for all the electrical work was awarded to Contractor Kassay, whose bid on the third building and on the combined work was lowest. Was Contractor Bana entitled to a court order requiring award to it of the work on the two buildings on which its bid was lower?

COURT'S ANSWER: No. (Bana Electric Corporation v. Board of Education, 194 N. Y. Supp. 2d 657, decided by the New York Supreme Court, Nassau County.)

The decision was influenced by certain New York statutes, but is in line with what courts in other states have decided.

The specifications and advertisement for bids required that there be a separate bid for each building addition and a separate bid on all three additions combined. The advertisement reserved right to reject any or all bids, or accept the one that in the Board's judgment would be for the best interest of the School District.

Bana bid $22,750 on School No. 4, $39,750 on School No. 8, $124,000 on a high school, and $185,000 as a combined bid. Kassay bid $25,341 on School No. 4, $41,254 on School No. 8, $107,612 on the high school and $173,000 as a combined bid.

As with the general construction contract and the plumbing, heating and ventilating contracts, the Board accepted the lowest combined bid. Bana contended that the Board was required by law to award the contracts for Schools Nos. 4 and 8 to it as the lowest bidder.

State law required that all contracts for public work involving more than $2,500 be awarded to the lowest responsible bidder, and required separate bids for the electrical work.

Except where separate projects involve separate assessments for improvements, two or more public works projects may be combined in one contract. Had the School District solicited combined bids only, it could legally award the contract to Kassay.

That the District deferred determination whether the contract should be awarded as a combined project or as separate projects until it could receive and weigh the respective bids did not deprive it of discretion to determine the scope of the project.

Competitive bidding was not stifled, for bidders were directed to submit separate and combined bids. The direction for combined bids and the reservation of the right to accept that bid which in the Board's judgment was for the best interest of the District was all the notice that was required. There was no indication of favoritism.

The advantage of having one contractor tended to secure a higher degree of uniformity, maximum control, and supervision, and the benefit to be derived from negotiating with one contractor for any changes in plan that might arise during construction.

The court noted that the only difference between the factual situation presented in this case and the accepted practice of requiring that a bidder state a fixed sum as an addition or deduction for a specified construction alternate was the size and scope of the alternate.

Unlicensed contractor's contract was terminated

THE PROBLEM: A Texas school district awarded electrical work on buildings under construction.

The contractor agreed to obtain necessary municipal permits and to coordinate this work with that of other contractors. The city refused to issue the necessary permits because he was not licensed as an electrical contractor as required by law. The school district cancelled his contract and relet the electrical work to another contractor.

Was the dismissed contractor and the surety on his performance bond liable in damages to the school district for the district's resulting loss?

COURT'S ANSWER: Yes. (Thornton v. Arlington Independent School District, 332 S.W. 2d 395, decided by the Texas Court of Civil Appeals, Fort Worth.)

The decision was based upon clauses in the contracts which provided: "If the Contractor should neglect to prosecute the work properly or fail to perform any provision of this Contract, the Owner, after three days' written notice to the Contractor may, without prejudice to any other remedy that he may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due to the Contractor; provided, however, that the Architect shall approve both such action and the amount charged to the Contractor.

"If the Contractor . . . persistently or repeatedly refuse or fail to supply enough properly skilled workmen . . . or persistently disregard laws, ordinances . . . or otherwise be guilty of a substantial violation of any provision of the Contract, then the Owner, upon certificate of the Architect that sufficient cause exists to justify such action, may, without prejudice to any other right of remedy and after giving the Contractor seven days written notice, terminate the employment of the Contractor and take possession of the premises and of all material, tools and appliances thereon and finish the work by whatever method he may deem expedient.

"The Contractor must, at his own cost, obtain all necessary permits . . . and comply with all State and Municipal building and sanitary laws, ordinances and regulations relating to building.

"The Contractor shall obtain all licenses and pay all fees and charges arising out of and in connection with the work."

Another clause provided that the School District might let other contracts in connection with the

(Continued on page 96)

New series of tables extended to include larger hourly rates

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

CONDUIT IN UNDERGROUND TRENCH - RIGID

OPEN TRENCH WORK

CONDUIT SIZE	HRS. PER C FT.	LABOR COST INSTALLED PER FT. AT FOLLOWING RATES										
		2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50
1/2"	2.2	.044	.05	.055	.061	.066	.072	.077	.083	.088	.094	.099
3/4"	2.4	.048	.054	.06	.066	.072	.078	.084	.09	.096	.102	.108
1 "	2.8	.056	.063	.07	.077	.084	.091	.098	.105	.112	.119	.126
1 1/4"	3.8	.076	.086	.095	.105	.114	.124	.133	.143	.152	.162	.171
1 1/2"	4.8	.096	.108	.12	.132	.144	.156	.168	.18	.192	.204	.216
2 "	5.9	.118	.133	.148	.162	.177	.192	.207	.221	.236	.251	.266
2 1/2"	7.6	.152	.171	.19	.209	.228	.247	.266	.285	.304	.323	.342
3 "	10.1	.202	.227	.253	.278	.303	.328	.354	.379	.404	.429	.455
4 "	15.6	.312	.351	.39	.429	.468	.51	.55	.59	.62	.66	.70
5 "	25.8	.52	.58	.65	.71	.77	.84	.90	.97	1.03	1.10	1.16
6 "	36.3	.73	.82	.91	1.00	1.09	1.18	1.27	1.36	1.45	1.54	1.63

E-101-B

LABOR: Includes handling material at site, cutting, threading and reaming, making bends, installing and connecting at terminus.

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CONDUIT THINWALL - NEW RESIDENCES
WOOD FRAME BUILDINGS

CONCEALED

COND. SIZE	HRS. "C"	LABOR COST INSTALLED PER FT. AT FOLLOWING RATES										
		2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50
1/2"	5.3	.106	.119	.133	.146	.159	.172	.185	.199	.212	.225	.239
3/4"	5.7	.114	.128	.143	.157	.171	.185	.20	.214	.228	.242	.257
1 "	6.7	.134	.151	.168	.184	.201	.218	.235	.251	.268	.285	.302
1 1/4"	8.9	.178	.20	.223	.245	.267	.289	.312	.334	.356	.378	.401
1 1/2"	11.2	.224	.252	.28	.308	.336	.364	.392	.42	.448	.476	.50
2 "	14.2	.284	.32	.355	.391	.426	.462	.497	.53	.57	.60	.64
		BRICK AND WOOD BUILDINGS										
1/2"	5.6	.112	.126	.14	.154	.168	.182	.196	.21	.224	.238	.252
3/4"	6.0	.12	.135	.15	.165	.18	.195	.21	.225	.24	.255	.27
1 "	7.0	.14	.158	.175	.193	.21	.228	.245	.263	.28	.298	.315
1 1/4"	9.5	.19	.214	.238	.261	.285	.309	.333	.356	.38	.404	.428
1 1/2"	11.8	.236	.266	.295	.325	.354	.384	.413	.443	.472	.50	.53
2 "	14.8	.296	.333	.37	.407	.444	.481	.52	.56	.59	.63	.67

C-102-B

LABOR: Includes handling material at site, drilling and notching access holes, bending and offsets, installing anchors, cutting, threading and reaming and installing conduit, also attaching at terminus.

I-61

CONDUIT (THINWALL) "IN CONCRETE SLAB" ** WAREHOUSES

CONCEALED

CONDUIT SIZE	HRS. "C"	LABOR COST INSTALLED PER FT. AT FOLLOWING RATES										
		2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50
1/2"	3.4	.068	.077	.085	.094	.102	.111	.119	.128	.136	.145	.153
3/4"	3.8	.076	.086	.095	.105	.114	.124	.133	.143	.152	.162	.171
1 "	4.5	.09	.101	.113	.124	.135	.146	.158	.169	.18	.191	.203
1 1/4"	6.0	.12	.135	.15	.165	.18	.195	.21	.225	.24	.255	.27
1 1/2"	7.6	.152	.171	.19	.209	.228	.247	.266	.285	.304	.323	.342
2 "	9.7	.194	.218	.243	.267	.291	.315	.34	.364	.388	.412	.437
		RIGID										
1/2"	4.1	.082	.092	.103	.113	.123	.133	.144	.154	.164	.174	.185
3/4"	4.4	.088	.099	.11	.121	.132	.143	.154	.165	.176	.187	.198
1 "	5.2	.104	.117	.13	.143	.156	.169	.182	.195	.208	.221	.234
1 1/4"	7.0	.14	.158	.175	.193	.21	.228	.245	.263	.28	.298	.315
1 1/2"	8.7	.174	.196	.218	.239	.261	.283	.305	.326	.348	.37	.392
2 "	11.0	.22	.248	.275	.303	.33	.358	.385	.413	.44	.468	.495

C-102-B

LABOR: Includes handling material at site, bending, cutting, reaming and threading, placing conduit, tying down and connecting at terminus.

I-61

Electrical Estimating—III

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News of the industry

edited for Southern readers

All-electric home financed by FHA

THE FIRST all-electric home in Dallas approved for financing by the Federal Housing Administration, the Clark Pelt-built home at 2515 Wood Valley Drive, has been recently completed.

The precedent-setting home is also one of the first in Dallas to use electric baseboard heating as a primary source of heat. Supplemental heat is provided by electric wall heaters in the bathrooms, and a ceiling heater-and-light unit in the kitchen work area. The electric baseboard heating is controlled by four wall thermostats which permit different temperature selections in the living area—the kitchen-den and living room—and in each of the three bedrooms.

One of 23 Westway homes being constructed by Clark Pelt near Illinois Avenue and Cockrell Hill Rd., the home was built as an all-electric home with electric baseboard heating at the request of its owners, Mr. and Mrs. R. G. McAfee.

R. G. McAfee, left, owner of Dallas' first FHA-financed all-electric home, confers with builder Clark Pel, center, and C. A. Lindberg, a residential service representative for Dallas Power and Light Co.

NAED members suggest new packing slip plan

AN INCREASINGLY VEXING and time-consuming problem is the locating of the manufacturer's packing slip by the electrical distributor's receiving personnel.

NAED Executive Director Arthur W. Hooper, in an "open letter" to electrical manufacturers, notes that it is gratifying to pass on a practical suggestion which can readily be complied with to the benefit of all concerned.

This matter of packing slips has been given some careful thought by members of NAED. In order that this problem might be reduced to a minimum, it is suggested that suppliers consider adopting the following:

"The carton containing a packing slip in a multiple shipment should be marked 'Packing Slip Enclosed' in bold red letters on all surfaces. It also should be loaded last in each separate shipment so as to be readily located upon unloading by the distributor's receiving personnel.

"The same procedure, in addition, might be followed when the packing slip is attached, instead of enclosed —except in this instance, the marking might read, 'Packing Slip Attached'."

Mr. Hooper, in his letter, said that manufacturers' cooperation in giving this matter and its obvious benefits to their distributors and their customers, serious attention, most certainly would be appreciated.

Mill-Power Supply renovates facilities

A COMPLICATED $200,000 top-to-bottom renovation of Mill-Power Supply Co., Charlotte, N. C., has been completed. The three-story building is located at 300 W. First St., and takes in 100,000 square feet of space.

Mill-Power, as it is better known, is a distributor of heavy electrical and industrial supplies in the Carolinas. The modernization has enabled the company to expand its operations and will result in more efficient handling of the many thousands of items distributed to dealers, industrial firms, and electrical contractors.

The company is a wholesale distributor for a complete line of heavy supplies and electrical equipment required in day-to-day industrial operations, in new construction, or in renovation of buildings and plants. The firm has approximately 100 employees in its wholesale department and keeps 15 salesmen on the road throughout the Carolinas.

The renovation had to be done without disrupting the daily in and out flow of merchandise. Design of the new layout and supervision of the work were under direction of N. A. Montgomery, chief sales engineer.

Moe portable displays feature light fixtures

THE MOE LIGHT Division of Thomas Industries, Inc., Louisville, Ky., is arming its distributors and retail sales outlets with new free-standing showroom displays, which can be erected quickly. Easy fixturing and refixturing are featured.

E. Allen Lea, Moe Light sales manager, said the new modular showroom units enable the residential lighting fixture dealer to erect a showroom of any size or shape in an evening without outside help. Installation and changing of fixtures is simplified by the use of removable panels that slide or lift out.

The full complement of Moe merchandisers includes lighting fixture displays; recessed fixture displays; post-lantern displays; and a counter-size, live-action display of Moe's new dimmer switch.

The new plant of RT&E Corp., located between Dallas and Ft. Worth, contains 21,750 square feet of floor space plus 3,300 square feet of office area.

RT&E in production at new Texas plant

RT & E Corp., Waukesha, Wis., is now in full production at its new $250,000 Arlington, Tex., plant.

The firm is assembling, testing, warehousing, and shipping all types of distribution transformers from the new plant, which has 21,750 square feet of floor area, plus 3,300 square feet of office space.

About 25 employees are presently employed at the Arlington location, which is capable of assembling more than 600 transformers a month. Nine sales representatives of the company also work out of the office, covering a seven-state Southwest area.

Clyde W. Shaw, executive vice-president of the 14-year-old firm, said the firm selected the Arlington site, which is situated on a four-acre tract in the Great Southwestern Development Corporation's industrial area in that city, "because the tremendous growth of electrical usage in the area makes the Southwest one of the finest markets for electrical distribution equipment in the country."

Don Parrish, plant manager at the Arlington plant, said that another reason for the location was that it is the center of the company's sales area for the seven states they will service: Arizona, New Mexico, Texas, Oklahoma, Louisiana, Arkansas, and Mississippi.

GE has gas turbine package power plants

General Electric announced recently a gas turbine package power plant which can be purchased for $100/kw and can be in operation ten days after delivery. According to Alan Howard, general manager of G-E's Gas Turbine Dept., these self-contained, factory-assembled power plants are ideally suited for peak load, emergency, or standby service.

Powered by an experience-proven, 11,000-kw gas turbine, the package plant is a compact, self-contained generating station capable of operation in conjunction with other generating equipment or as an isolated and independent station. It can start without any external source of power and can be on the line at full load in less than 15 minutes.

The package plant is a complete and integrated power station consisting of two basic units plus accessories. Both the power unit and the generator unit are mounted on integral structural steel bases and are housed in trim all-weather enclosures.

The power unit, measuring approximately 10 by 36 feet, contains the gas turbine, station controls, and mechanical and electrical auxiliaries.

The 10- by 28-foot generator unit contains an open ventilated generator, reduction gear, exciter, and cooling air system. The air inlet ducts, exhaust stack, maintenance crane, and outdoor metal-clad switchgear make up the plant accessories.

Contractor, utility share new building

David Revels of Revels Plumbing and Electric Co., Iva, S. C., has improved the looks of his community, caused a power company to open a sales and service office, become a landlord, and gained new quarters for his own business — all in one operation.

Mr. Revels built a modern brick facility in Iva and signed a long-term lease with Duke Power Co., giving them the greater portion of the building. Mr. Revels himself has the remaining portion.

It was the first new building to be erected in the downtown area in several years and mayors of several communities hailed its opening in official ceremonies. Also present for the opening ceremonies were W. B. McGuire, of Charlotte, N. C., president of Duke Power Co., and a number of other high-ranking power company officials.

The Duke office is offering a number of services, including residential and commercial consultants; agricultural, lighting, and wiring engineers; and home service advisors.

H. G. McMullan is supervising the facility and Mrs. Barbara Stovall is office manager. A. M. Doolitte, of Anderson, S. C., is district manager.

When Mr. Revels had the building erected, he did the electrical wiring!

Fraser of Rome Cable is new NEMA president

New officers for the National Electrical Manufacturers Association were named recently at the association's 34th annual meeting, in New York City, with A. D. R. Fraser, Rome, N. Y., president of Rome Cable Div., Aluminum Company of America, elected president.

Mr. Fraser had been treasurer of NEMA for the past year. He succeeds N. J. MacDonald, Elizabeth, N. J., president of the Thomas and Betts Co., Inc.

W. R. Persons, St. Louis, Mo., president of Emerson Electric Manufacturing Co., was elected vice-president

of the association, and A. E. Pringle, II, Philadelphia, Pa., president, Pringle Electrical Manufacturing Co., was elected treasurer.

Mr. Fraser joined the Rome Cable organization at its formation, as secretary and a director. He is a member of the board of directors of the NEMA Wire and Cable Div.

S&C show models of new switchgear

S & C ELECTRIC Co., 1435 N. Ravenswood, Chicago 40, Ill., is sending four road-show models of its new Circuit-Switcher family of switchgear into the field for demonstrations to interested utilities and consultants, according to John R. Conrad, S & C president.

Circuit-Switcher is a 34.5- to 138-kv load interrupting device that combines the features of load interrupter switches and circuit breakers. It was introduced six months ago. "The great interest shown in this new breed of switchgear has prompted us to make the four demonstrators available throughout the country," Mr. Conrad explains.

Cutaway operating elements show how a new load interrupting unit introduced with Circuit - Switcher carries full-load current continuously. Also in plain view is the "brain" mechanism that supervises the sequence of operations.

New meter included in 'Action Plan Kit'

A NEW, REVOLUTIONARY low-cost meter called the Liteprobe is a basic element in an "Action Plan Kit"

The Lite-Probe meter is featured in the Graybar "Action Plan Kit".

Graybar Electric is furnishing to electrical contractors with necessary information and materials to promote profitable modernization relighting in older buildings and outdoor spaces to their customers.

The Liteprobe is manufactured by the Pyramid Instrument Corp., 630 Merrick Rd., Lynbrook, L. I., N. Y.

Essentially, the Liteprobe is a foot-candle meter with a rotary scale having five different lighting-level indications. Scales are lettered A, B, C, D, and E. Accompanying the meter are two lighting guides: an easy-reference chart set into the Lightprobe's leather carrying case, and a combination instruction and lighting-level guide.

The electrical contractor need only refer to the chart or the guide to find the correct scale for the lighting condition he is checking. Then, when the Liteprobe is set on the proper scale, a needle points toward a red or green area indicating good or poor lighting.

Features of the meter are east of operation, simplicity of reading, low cost, and high dependability.

Brief news notes of manufacturers

JASPER BLACKBURN Corporation and the Pieper-Lillard Division of the firm announce the appointment of Robert D. Cleaves, R98 Lotawana Lake, Rt. 1, Lee's Summit. Mo., as manufacturer's representative for the Kansas and western Missouri areas.

Glenn A. Watkins, 1900 Westchester St., Oklahoma City, Okla., has also been appointed to serve the state of Oklahoma in the same capacity.

The announcement was made by Jack Cain, sales engineer for Jasper Blackburn.

* * *

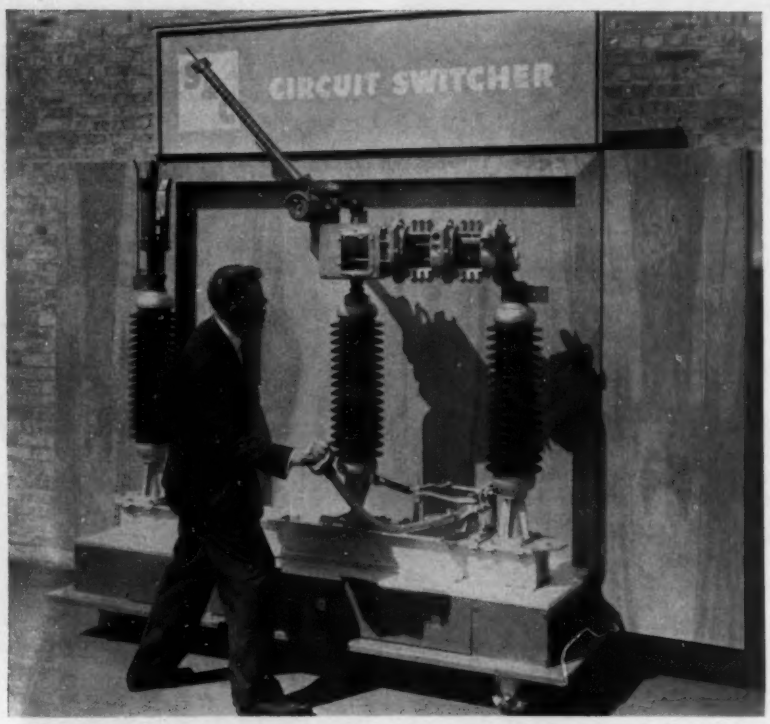
A NATIONAL sales service division has been created by S&C Electric Company to coordinate customer service, according to John R. Conrad, S&C president.

Jack B. Castle, formerly manager of the east central sales division, will head the new sales services division. Philip J. McLaughlin has been promoted from assistant manager to manager of the east central sales division, including Illinois, Wisconsin, Michigan, Ohio, Indiana, Kentucky, Florida, Georgia, Tennessee, Alabama, North and South Dakota, and Minnesota.

* * *

WESTINGHOUSE ELECTRIC Corporation has announced the expansion of its Total Electric Home program into a newly formed organization—the residential marketing department.

William H. Loeber, former Total Electric Home marketing manager, has been named manager, residential marketing department. He will report to Chris J. Witting, vice-president, consumer products, and will be headquartered at the company's offices in New York City.



S&C Electric Company is sending out four road-show models of its new Circuit-Switcher for demonstrations to interested utility engineers.

"Builders are interested today in buying as many services and products as possible from one supplier," Mr. Witting declared. Included in the Westinghouse product line are heating and cooling equipment, wiring devices, meters, appliances, television and radio, lighting, and Micarta counter tops or wall paneling. In the case of apartment projects, electrical switchgear and elevator installations are also available.

New regional managers for residential marketing include: southeastern region, John G. Adams, 1299 Northside Drive, N.W., Atlanta; and southwestern region, Charles R. Beatty, 411 North Seventh Street, St. Louis.

* * *

ESQUIRE, INC., publisher of *Esquire* and *Coronet* magazines, has purchased the Wide-Lite Corporation of Houston, a leading manufacturer of floodlighting equipment.

In making the announcement, Wide-Lite president W. F. Wilson said that present company policies, operating procedures, and personnel would remain the same. John Smart president of Esquire, Inc., called the acquisition a part of that firm's program of building a stronger and more diversified company.

The Houston-based firm manufactures outdoor area lights and floodlights for athletic fields, parking facilities, security areas, building exteriors, and a wide range of other applications.

* * *

B. WEINGARTEN of Baltimore is joining Electric Distribution Products, Inc., 2200 31st Street S. W., Allentown, Pa., to take charge of sales for Maryland, Washington, D. C., and surrounding counties.

His sales will cover a complete Masterguard system consisting of Uni-Bus duct, motor control centers, panelboards, and switchboards.

* * *

WALKER BROTHERS, of Conshohocken, Pa., announces the appointment of George P. Mitchell, 920 Volz Drive, Crestwood 26, Mo., as sales representative covering southern Illinois and Missouri. Walker products handled include underfloor electrical distribution systems, Dualbrite electrical metallic tubing, and wires and cables.

* * *

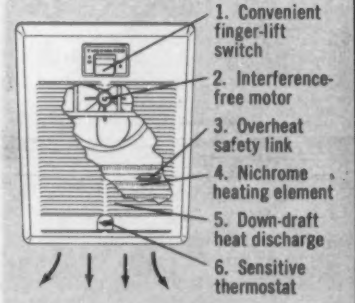
HOLAN CORP., Griffin, Ga., has purchased the assets of Timpte Bros., Inc., of Denver and Albuquerque, J. Howard Holan, president of Holan, announced recently.

Timpte manufactures a complete line of semi-and low-bed trailers, truck bodies, and associated equipment.

The new Timpte $1.5 million plant in Denver will provide facilities in the West for both Timpte and Holan

THERMADOR "Seven Leagues Ahead" in the science of electric heating

Economical Fan-Type Heater



120 or 240 Volts AC

Ideal Small-Room Comfort

THERMADOR

Bilt-in Electric Heaters

Millions in Use

Model "NB" medium wattage fan-type electric heater (shown above) is designed to give quick, circulated warmth to small areas. Perfect for nursery, den, dressing room, dinette, breakfast room, kitchen, bath or office.

Clean, dust-free, modern design of the flush-to-wall safety grille circulates heat into the "living zone" of the room. No wasted accumulation of heated air at the ceiling.

This compact room heater features convenient top-of-the-heater finger-lift control switch. Available with or without thermostatic control in rich Spanish Gold or glossy White baked enamel finish.

Grille: 12¼" wide x 16⅜" high x 13/16" from wall.

Wall Box: 10⅛" wide x 14⅝" high x 3⅞" deep. 1650 Watts output, 120/240 Volts A.C., 5630 B.T.U.'s per hour.

COMPLETE LINE FOR ALL APPLICATIONS
Model NW Master duty fan-type
Model RB Radiant space-saver
Model CH-121 Ceiling fan-type
Baseboard heater 30¾" to 121¼"
Model LR Full-length radiant
Model NB Medium-wattage fan-type

Originator of the Fan-Type Bilt-in Electric Heater

THERMADOR Electrical Manufacturing Co.

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products. New "Sales and Servicenter" factories are also planned in the West.

* * *

S&C ELECTRIC Company has acquired a 33,000 square foot building and two acres of land adjoining its manufacturing and laboratory facilities at 6601 N. Ridge Ave., Chicago.

The company plans to modernize the structure. It will be used for manufacturing and as a warehouse.

S&C is a manufacturer of high-voltage switchgear for electric utilities, industrial plants, and commercial buildings.

Company president John R. Conrad said the purchase was made to "help insure future company growth." The property is immediately north of the company's present 117,000 square foot manufacturing plant and $2-million laboratory.

* * *

KEYSTONE Manufacturing Company announces the appointment of Dupont-Bondurant, Inc., as sales representatives in Louisiana and southern Mississippi.

Dupont-Bondurant will handle the complete Keystone line of wiring installation equipment. Their offices are located at 717 Jefferson Highway, New Orleans 21, La.

* * *

DELCO SALES Assoc., Inc., 3615 N. W. 47th St., Miami 42, Fla., has recently been appointed to represent the James F. Burns Co., Philadelphia, throughout Florida. Ed Nelson made the appointment for Burns.

* * *

BERKO Electrical Manufacturing Company of Queens Village, N. Y., has appointed the George E. Anderson Co., Dallas, Tex., as their manufacturer's agent for the Southwest.

Dates ahead

National Assn. of Lighting Maintenance Contractors, Southern Regional Meeting, Birmingham, Ala., Jan. 28-29, 1961.

AIEE Winter General Meeting, Hotel Statler, New York, N. Y., Jan. 29-Feb. 3, 1961.

National Rural Electric Cooperative Assn., Annual Meeting, Dallas, Tex., Feb. 12-16, 1961.

Missouri Valley Electric Assn., Industrial and Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 16-17, 1961.

Southern Safety Conference and Exposition, Atlanta Biltmore Hotel, Atlanta, Ga., March 5-7, 1961.

National Lighting Exposition, Coliseum, New York, N. Y., March 5-8, 1961.

IAEI, Mississippi Chapter, Heidelberg Hotel, Jackson, Miss., March 27-28, 1961.

Southeastern Electric Exchange, Annual Conference, Boca Raton Hotel & Club, Boca Raton, Fla., March 27-29, 1961.

AIEE South East District Meeting, Jung Hotel, New Orleans, La., April 5-7, 1961.

IAEI, Georgia Chapter, Forrest Hotel, Rome, Ga., April 10-11, 1961.

IAEI, Ellis Cannady Chapter, Carolina Hotel, Raleigh, N. C., April 12-13, 1961.

Missouri Valley Electric Assn., Engineering Conference, President Hotel and Municipal Auditorium, Kansas City, Mo., April 12-14, 1961.

Southeastern Electric Exchange, Engineering & Operation Section, Hollywood Beach Hotel, Hollywood, Fla., April 12-15, 1961.

IES Southwestern Regional Conference, Skirvin Hotel, Oklahoma City, Okla., April 16-18, 1961.

IAEI, Alabama Chapter, Tutwiler Hotel, Birmingham, Ala., April 17-18, 1961.

Alabama Electrical and Electronics Exposition, Second Annual Exposition, Birmingham City Auditorium Convention Hall, Birmingham, Ala., April 17-19, 1961.

IES Southeastern Regional Conference, Atlanta Biltmore Hotel, Atlanta, Ga., April 19-21, 1961.

IAEI, South Carolina Chapter, Cabana Inn, Spartanburg, S. C., April 20-21, 1961.

IAEI Five - Chapter Joint Meeting—Baton Rouge, George Welman, North Louisiana-East Texas, Texas, and Texas Gulf Coast Chapters—Windsor Hotel, Abilene, Tex., April 28-29, 1961.

National Assn. of Electrical Distributors, Annual Convention, Detroit, Mich., April 29-May 3, 1961.

IAEI, Florida Chapter, Casa Marina Hotel, Key West, Fla., May 5-6, 1961.

IAEI, Executive Council, Statler Hotel, Detroit, Mich., May 14-19, 1961.

IAEI, Virginia Chapter, Hotel Roanoke, Roanoke, Va., June 12-13, 1961.

AIEE Summer General Meeting, Cornell University, Ithaca, N. Y., June 18-23, 1961.

IES National Technical Conference, Chase Park Plaza Hotel, St. Louis, Mo., Sept. 24-29, 1961.

National Electrical Contractors Assn., Washington, D. C., week of October 9, 1961.

AIEE Fall General Meeting, Statler-Hilton Hotel, Detroit, Mich., Oct. 15-20, 1961.

IAEI, Southern Section, Grove Park Inn, Asheville, N. C., Oct. 16-18, 1961.

News about people

Mathias Klein and Sons, Inc., Chicago manufacturer of pliers and electrical equipment, announces the appointment of **H. B. Wilson** as general sales manager. Mr. Wilson has been associated with Klein for the past 20 years.

Charles Castino, who had charge of Chicago sales, has been appointed sales manager, specializing in the electronics field, while **William Walley** will represent Klein in Atlanta.

Corning Glass Works has announced appointment of **William M. Baldwin** as manager of market development for lighting products, with headquarters at Corning, N. Y.

Mr. Baldwin succeeds **Frederick F. Fleischman, Jr.,** who has been named district sales manager of the Pittsburgh, Pa., office of the company's Technical Products Div.

Mr. Baldwin joined Corning in 1950 as a junior engineer. He holds a bachelor's degree from Bethany College and a master's degree from Pennsylvania State University.

Clifford B. McManus, formerly chairman of the board of the Southern Company and president of the Georgia Power Co., retired from active service recently, but will continue to serve as a director.

Mr. McManus has spent his entire career in the electric utility industry. At the beginning of 1951, Mr. McManus was chosen to head the Defense Electric Power Administration of the Department of the Interior. He has served as director and com-

mittee chairman of the Edison Electric Institute, and is a former president of the Southeastern Electric Exchange.

Following his graduation from Auburn University in 1916, he continued his training in electrical engineering at the Westinghouse shops in Pittsburgh. In March, 1917, he joined Alabama Power Co.

Frank C. Payne, formerly manager of internal services for Kansas City Power and Light Co., was recently named staff assistant to **Charles F. Monnier,** executive vice-president of the company.

Wayne R. Johnson replaces Mr. Payne as manager of internal services.

E. B. McBurney, Jr., was named superintendent of stores to replace Mr. Johnson. **H. J. Dunshee, Jr.,** was named staff engineer in the transmission and distribution department. **Forrest Rouland** was named industrial engineer in the Kansas City sales department.

William W. Smith of Wethersfield, Conn., has been named manager—marketing by **C. P. Hayes,** general manager, Circuit Protective Devices Dept., General Electric Co., Plainville, Conn.

In his new position, Mr. Smith has management responsibility for all of the marketing activities of the

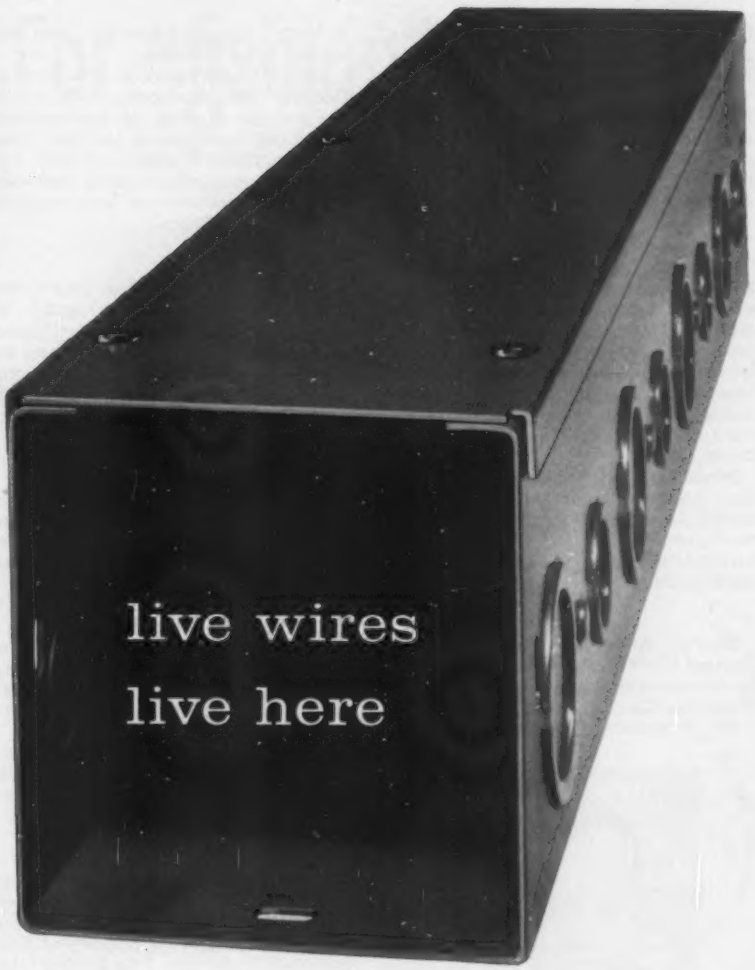
William W. Smith

department, including sales, advertising, product planning, customer service, and market research organizations.

Mr. Smith has been associated with General Electric since 1951. He was named manager—distributor sales in 1957, a position he has held until the present.

A native of Schenectady, Mr. Smith holds an SB degree in engineering from Massachusetts Institute of Technology and an MBA degree from the Harvard Graduate School of Business Administration.

Robert P. Lunsford, former Georgia Power distribution engineer at Athens, has been named Dublin dis-



Lots of live wires depend on the protection of Keystone wireways and auxiliary fittings. Quality features such as a completely open 'lay-in' design for fast, careful installation of wires, folded covers for added rigidity and interior screw tip shields—all help to keep electrical wiring *alive and well . . . permanently.*

Keystone has standard or galvanized wireways and fittings stocked in all types, shapes and sizes . . . ready for immediate delivery.

Lots of 'live wire buyers' know they can depend on Keystone . . . what about you?

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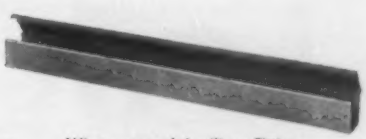
JIC Pull Boxes



Wireways and Auxiliary Fittings

KEYSTONE
MANUFACTURING COMPANY
DIVISION OF AVIS INDUSTRIAL CORPORATION
23333 Sherwood Ave. • Warren, Michigan

trict engineer, **W. W. Amis,** the company's Dublin district manager, has announced.

A native of Seffner, Fla., Mr. Lunsford holds a BS degree in electrical engineering from Auburn University. He joined the company as a field engineer at Athens and also has held engineering posts at Cornelia.

Columbia Cable Electric Corp., Brooklyn, N. Y., manufacturers of electrical cable and conduit, has appointed **Michael T. Regan** as general sales manager. Mr. Regan will be responsible for marketing, distributor relations, and Columbia's national sales agents. He was formerly sales manager of Ilsco Corp., Cincinnati.

Michael J. St. John, former general sales manager, has been promoted to general manufacturing manager. He will be responsible for production, product engineering, and quality control.

H. C. Anderson and **John M. Tomme** have recently been promoted by Southern States Equipment Corp., Hampton, Ga.

Mr. Anderson, a graduate of Geor-

H. C. Anderson

gia Tech, has been promoted to the position of sales manager—protective equipment. Mr. Anderson, who has been with Southern States since 1946, has held positions as chief inspector,

John M. Tomme

western district manager, and assistant sales manager.

Mr. Tomme, also a graduate of Georgia Tech, has been promoted to the position of sales manager—power switching equipment. He has been with Southern States since 1953 and has held positions as field engineer, district representative, and regional manager.

William E. Newberry, of 4507 Ayers Rd. Macon, Ga. has been named the Georgia Power Company's Macon division industrial sales engineer, according to **C. W. Roberts,** power company vice-president. He succeeds **William H. Kubler,** who has been promoted to the post of assistant manager of the company's industrial sales engineering division in Atlanta.

Mr. Newberry holds the degree of bachelor of science in electrical engineering from Georgia Tech. He joined the company as a draftsman in Athens in 1950. He is a graduate of the Georgia Power Company's nuclear reactor engineering course.

Mr. Kubler holds the degree of bachelor of science in mechanical engineering from Georgia Tech. He joined the company in 1936 as a utilization engineer.

Mr. Kubler is past president, secretary, and treasurer of the Georgia Society of Professional Engineers, Macon chapter.

John J. McDonough, president of the Georgia Power Co., has been named the Georgia Engineer of the Year by the Georgia Society of Professional Engineers. The Society also has nominated Mr. McDonough as its candidate for engineer of the year of the National Society of Professional Engineers for 1961. This marks the first time a Georgian ever has been nominated for the national honor.

Mr. McDonough was graduated from Georgia Tech in 1923. He was quarterback on the Tech football teams of 1919 through 1922. Mr. McDonough has been associated with the Georgia Power Company since 1927, beginning his utility career at Dublin. He has been president since 1957.

New assignments in the research and development division of Day-Brite Lighting, Inc., have been announced **by J. F. Whitehead,** president of the firm.

Heading the division as director of research and development is **Charles L. Amick,** who was formerly executive director of research. At the same time, it was announced that two new groups had been formed within the division; a technical services department with **Richard D. Bradley** as manager, and a product research department with **Murray L. Quin** as manager.

Mr. Amick joined Day-Brite nearly five years ago following many years in application engineering work with the G-E Lamp Division at Nela Park in Cleveland. He is a graduate of Iowa State University and a registered professional engineer. He is a fellow and director of the Illuminating Engineering Society, and author of the "Fluorescent Lighting Manual."

Mr. Bradley is an electrical engineering graduate of Kansas State College and a fellow of the Illuminating Engineering Society. He is active on many technical committees of national scope in IES, the National Electrical Manufacturers Association and the International Commission on Illumination.

Mr. Quin has had extensive experience in fixture development, design, and building research. He studied architecture at Washington University in St. Louis and has authored several papers on illumination, notably in the areas of modular coordination and combination lighting-air diffusing equipment and techniques. The indexing method for correlating recessed lighting with ceiling systems is one of his contributions. Mr. Quin is chairman of the ASA Committee on Coordinated Ceilings and has been active in programs of the Building Research Institute.

Two managerial changes in Duke Power Company have been announced by **O. J. Miller,** executive vice-president.

Named executive assistant was **C. E. Poovey,** formerly an apparatus engineer.

Named manager of Duke's Industrial Power Department was **E. R. Davis,** formerly assistant manager of that department.

Six promotions were announced recently in Duke Power Company's office production and transmission group:

Lloyd P. Julian, formerly superintendent of operation, was promoted to manager of operation; and **W. J. Wortman,** formerly superintendent of relays, meters, and communications, was named manager of that department.

In the Transmission Engineering Dept., **W. H. McKinnon** was promoted from engineer to transmission line engineer; **G. L. Finley** from assistant substation engineer to substation engineer; and **W. E. McRae, Jr.** from assistant apparatus engineer to apparatus engineer.

In the Electrical Maintenance and Construction Dept., **C. W. Cox** was promoted to assistant superintendent of electrical maintenance and construction of stations.

G. E. Blevins, manager of Tampa Electric Company's Plant City Division, recently retired, and **Ted Van Steenburg,** formerly assistant manager of the Plant City Division, has been promoted to division manager.

G. E. Blevins

This announcement was made by **Fischer S. Black,** vice-president — administrative of Tampa Electric, and company officer in charge of division operations.

Mr. Blevins has been in the electric utility business since 1925, following his graduation from Texas Agricultural and Mechanical College.

T. Van Steenburg

Mr. Van Steenburg joined Tampa Electric in 1949, following graduation from the University of Florida with a degree in electrical engineering. He has served Tampa Electric in a number of capacities, including industrial sales, engineering, and safety.

E. F. Mulligan (Jones Metal Products) West Lafayette, Ohio, was recently elected president of the RLM Standards Institute, Inc.

Other officers elected were **A. C. Kendall** (Sylvania), vice-president; **D. E. Worrell** (Quadrangle), secretary; and **D. E. Collins** (Jones Metal Products), treasurer.

Larry J. LeVieux has been appointed advertising and sales promotion specialist at General Electric's Ballast Department Danville, Ill., it was announced recently by **C. Gus Grant,** the department's manager of marketing.

Mr. LeVieux was graduated from the University of Oklahoma in 1955 with a degree in journalism.

For "fishing" conduit...

USE NEW JET LINE® NON-CONDUCTIVE RIGID ROPE*

...safer...speedier...costs less, too!

* Pat. pending

In any size, any type conduit, fish with Jet Line RIGID ROPE and do away with dangerous metal tapes.

- Non-conductor — braided poly jacket over solid poly core.
- Flexible — easy to push, easy to grip, won't "spring" out of hand, glides smoothly without drag or damage to conduit.
- Long-lasting—can't rust, won't separate, strong and durable.
- Lightweight—50′ length weighs only 14 oz.
- 50′ and 100′ lengths — costs less than any fish tape designed for use in all types of conduit.

"Guide Sleeve" of polyethylene, 12" length, included—for use in feeding Jet Line RIGID ROPE into outlet boxes.

For full information on RIGID ROPE, and the complete Jet Line Method of wiring conduits, ask your distributor or write

5176

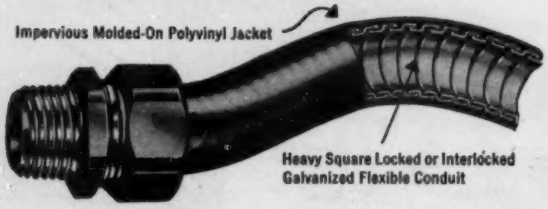
JET LINE PRODUCTS, INC.

615 FUGATE AVE., CHARLOTTE 5, NORTH CAROLINA

Moisture just can't penetrate

LIQUATITE®

FLEXIBLE LIQUID-TIGHT WIRING CONDUIT



...nor can grease, dirt, oils, alcohols or most other corrosive vapors, acids, or other harmful elements. Circuits are *completely* protected.

Liquatite can be installed as quickly and easily as Flexible Conduit, yet assures the protection of Rigid Conduit. It follows contours, absorbs motion, vibration and shock indefinitely.

Find out why Liquatite is serving industry everywhere. Write today for free sample, costs and name of Distributor nearest you.

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MISSOURI
Kansas City
Parkins & Bretz Company
500 V.F.W. Building
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Riverside 1-6241
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1723 Arlington Road
Elgin 3-2272

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P. O. BOX 128-N — ROSELLE, ILLINOIS

COMPARE*

Blackhawk's full, perfect threads

with any other fittings on the market

See for yourself that Blackhawk EMT fittings have full, true, perfect threads for ease and speed of installation. Bodies of heavy steel or malleable iron — cadmium and zinc finished to eliminate corrosion on the unit itself. Blackhawk's new EMT fittings are rain tight. Quality controlled at every phase of the manufacturing. Available in complete range of sizes.

Find out why these small, easy to use fittings are best for any electrical job, large or small.

SEND THIS COUPON TODAY

COMPARE BLACKHAWK'S FULL PERFECT THREADS
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Please send my free sample of Blackhawk fittings.
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Blackhawk Industries, Dubuque, Iowa
Where the new ideas come from

Technical books

Practical methods

"Practical Electrical Wiring," Sixth Edition, by H. P. Richter. Published by McGraw-Hill Book Co., Inc., 327 W. 41st St., New York 36, N. Y., 592 pages, 463 illustrations, $7.95.

Practical methods for handling wiring and installation jobs are presented in this newly published manual. It shows how to plan and carry out all types of lighting and power wiring jobs on the farm, in homes, factories, stores, schools, and other structures.

In addition to presenting fundamentals, terminology, basic principles, theory behind practices, and practical wiring instructions, the book includes hundreds of on-the-job tips and short-cut suggestions.

Thoroughly rewritten, the sixth edition has been revised to be in line with the 1959 edition of the National Electrical Code. The latest procedures are reflected in a special section on farm wiring problems, and in another on principles of good lighting. Included is the analysis of wiring sectional ranges and ovens, covered in the 1959 Code for the first time.

In addition, the book provides fresh coverage on wiring refrigerating type hermetic motors, recent types of lighting, and on the characteristics and procedures of installing the "MI" cable.

The book is planned to enable the reader to learn electrical wiring in a practical fashion, telling him not only how to do things, but also explaining the reasons why. All facts are presented in strict accordance with the National Electrical Code.

Preferred circuits

"Handbook Preferred Circuits, Navy Aeronautical Electronic Equipment, NAVWEPS 16-1-519, Supplement No 3," available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., 100 pages, $0.55.

This latest supplement to "Handbook Preferred Circuits" contains seven germanium transistor circuits (PC 210 through 216), two silicon transistor circuits (PC 252 and 253), and one vacuum-tube instrument servo circuit (PC 79).

Preferred circuits 210-216 are a compatible set of transistor digital logic circuits for use in computer, control, and communication equipment.

PC 252 is a variable gate generator, and PC 253 is a non-saturating bistable multivibrator capable of operating at rates up to one mc.

The vacuum-tube circuit, PC 78,

is a phase-sensitive null detector for use in servo control circuits. The looseleaf format of Supplement 3, like the original handbook and Supplements 1 and 2, allows the new circuits to be added to the handbook.

The original Handbook Preferred Circuits, NAVAER, 16-1-519, published in 1956 is now in its third printing (price $1.75). The first Supplement was issued in March 1959 (price 60 cents), and the second Supplement was issued in December 1959 (price 30 cents).

Helpful literature

A new eight-page booklet completely and concisely presents the entire **circuit breaker** and load center line of **Murray Manufacturing Corp.**, 1250 Atlantic Ave., Brooklyn 16, N. Y. It features Murray's "Guaranteed for life" 'MP' breaker line and explains how contractors can use the Murray "Guaranteed for Life" program to increase sales and profits.

Load centers are described in detail with catalog listings, pictures, and wiring diagrams. Breaker capacity for single, double, duplex and three-pole breakers is shown for each enclosure.

Write B-118 on reply card, pg. 17

Bulletin GEA-6358C, of the **General Electric Co.**, Schenectady 5, N. Y., describes the company's CR101 **manual motor starter** for fractional-horsepower motors and CR1062 manual motor starter for integral horsepower motors up to 7½ hp. Divided into two sections, the 12-page publication includes photos with call-outs explaining construction features of both units. Outline diagrams show dimensions. Heater selection tables and prices for both types are also included.

Write B-119 on reply card, pg. 17

A revised and enlarged edition of the **insulation** booklet, "How to Insulate Your Home for Electric Heating," has been issued by the **National Mineral Wool Association**, Rockefeller Center, 1270 Sixth Ave., New York 20, N. Y. Single copies of the new booklet are free.

Write B-120 on reply card, pg. 17

The **H. M. Harper Co.**, Morton Grove, Ill., nut and screw manufacturer, has designed a four- by eight-inch card that works like a slide rule and tells in seconds how each of eight types of metal withstands the **corrosive effects** of 141 chemical agents. The metals are common in mechanical work—brass and naval bronze; silicon bronze; monel metal; stainless types 410, 416, and 430; stainless types 302, 303, 304, and 305; stainless type 316; copper; and aluminum.

Write B-121 on reply card, pg. 17

ROYAL Portable Cords

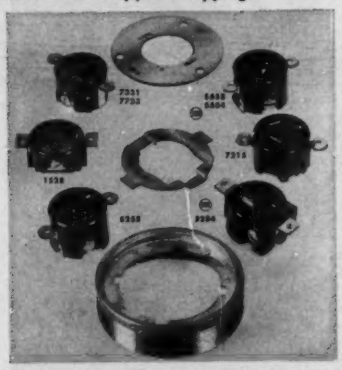
are dependable, easy working, made right to be right on every job, time after time after time. Royal is the BIG line, too . . . rubber, neoprene and thermo-plastic, as well as lamp cords, fixture wires, machine tool wires, thermo cables, bell wires, coaxial cables, and more. All packaged for fast, easy identification. So when you buy wire and cable, specify ROYAL, the line that's preferred by electrical men everywhere. See your wholesaler, or write for catalog, giving wholesaler's name.

ROYAL ELECTRIC ...an associate of ITT

ROYAL ELECTRIC CORPORATION
PAWTUCKET • RHODE ISLAND
In Canada: Royal Electric Company (Quebec) Ltd.
Pointe — Claire, Quebec

REPRESENTATIVES:
Cary Chapman & Co., Atlanta—New Orleans—Greensboro—Birmingham
Sachman Associates, Inc., Miami
NuRo Company, Houston—Dallas—San Antonio

This "KEY" which is now a part of our #190 series, fits most popular style and size receptacles found on your Distributor's shelves—and stops ear clipping.



Adjusting ring for our 190 series is so designed that KEY drops easily into special slots. You select the receptacle required and simply "LAY-IN"; then "LAY-ON" receptacle ring. This has been added at no extra cost.

FULLMAN'S
Adjustable
STEEL BOX
190-N R Series
No Receptacle

The #190 "Tru-Level" series is a standard 4" octagon, sheet steel box for concrete or tile, also wooden floors with concrete base. It is 2½" deep with ½" adjusting ring and three screw legs 2½" long which make for quick and easy tru-leveling.

You can now pour concrete to very top of box and still have plenty of room for conduit attachment or wire pulling.

A 3¼" opening in box permits whole hand access from top of concrete to bottom of floor box.

NEW, LARGER
PIPE or CONDUIT HANGER

A new, larger hanger to accommodate 2" thru 2½" will be available soon. Especially good for confined areas. Write for complete information.

Sold only Thru Wholesalers

LATROBE PRODUCTS

NON-ADJUSTABLE FLOOR BOXES—ADJUSTABLE FLOOR BOXES—GANG BOXES—COVER PLATES—JUNCTION BOXES—NOZZLES—PIPE OR CONDUIT HANGERS—INSULATION SUPPORT—CABLE SUPPORTS—FISH WIRE STAPLE AND CABLE CLIPS

FULLMAN MANUFACTURING CO.
LATROBE . . . PENNSYLVANIA

New products

Jet Line Rigid Rope

A safe, easy-to-use, economical replacement for metal fish tape has been introduced by Jet Line Products, Inc., 615 Fugate Ave., Charlotte, N. C.

Called Rigid Rope, it is made of non-conductive polyethylene, and is designed for use in any size or type conduit.

The Rigid Rope is constructed with a braided poly jacket over a solid poly core, making a line that is flexible and easy to grip without "springing" out of hand. Rigid Rope weighs only 14 ounces per 50-foot length, will not rust or separate, and tests at 800 pounds pull. It glides easily through conduit, and will not damage pipe.

The Rigid Rope is available in 50- and 100-foot lengths. Each package includes a polyethylene "Guide Sleeve," 12 inches long, for feeding the Rigid Rope into outlet boxes.

Write P-122 on reply card, pg. 17

Precision tubeless controls

Utilities, municipalities, and other users of outdoor lighting can now obtain tubeless controls in meter-type housings at the price of low-cost, locking-type controls, from Precision Multiple Controls, Inc., 233 Chestnut, Ridgewood, N. J.

Two-component outdoor lighting controls previously have been available in meter-type housings only on special order and at a premium price.

Mounted on a standard watt-hour meter base plate and enclosed in a shallow glass housing, the new unit is otherwise identical with Precision photo controls for lighting approved by EEI-NEMA and presently used on more than 400,000 installations.

In operation, a cadmium sulfide photo cell behind the meter face activates a bimetal switch to turn lights on automatically at sunset and off at sunrise. A lightning arrestor completes the simplified circuitry enclosed in the all-weather housing.

Write P-123 on reply card, pg. 17

Cavalier baseboard heater

A new thermal cut-out is featured on the new F series electric baseboard just introduced by Cavalier Corp., 343 W. First St., Chattanooga 2, Tenn.

This feature is designed so that

LOOK what we've had up our sleeve!

Now IT'S OUT

Another **SHAWMUT**® *First . . . All NEW* **ONE-TIME FUSE** *(Silver-Plated)*

Meets Federal Specs For One-Time & Time Delay. Exceeds all industry standards for One-Times. U.L. Approved Buy now for "predictable performance."

THE CHASE-SHAWMUT CO.
Subsidiary of I-T-E CIRCUIT BREAKER CO.
374 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

if any object falls on the baseboard and obstructs the air flow, the circuit will automatically be broken before the heat reaches the danger point. Removal of the obstruction sends the heater back to work automatically.

The baseboard also features an improved airflow design with greater wattage per lineal foot, yet it maintains a low 125-degree surface temperature. Another feature is the fully enclosed heating element. This tubular steel sheath contains resistance element and a welded-on vertical fin to help radiate heat without obstructing air passage or creating dust traps.

Cavalier also has a thermostatic control section which builds into the baseboard lineup. The new electric baseboard is made in 32-inch and 48-inch sections.

Write P-124 on reply card, pg. 17

Hammer-in fastening tool

An improved Shure-Set hammer-in fastening tool, designed to meet the needs of contractors in more rugged hammer-in work, is being introduced by Ramset Fastening System, Olin Mathieson Chemical Corp., 460 Park Ave., New York 22, N. Y.

The handle of the new tool extends from the barrel, away from the striking surface. This handle keeps the worker's hand away from the area of impact in heavy-duty hammer-in work. The handle also enables workmen to set fasteners more easily in hard-to-reach places such

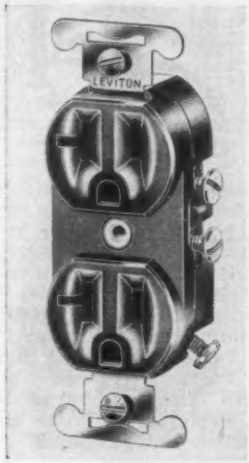
as the limited space between conduit and electrical switch boxes. Using the standard of the heavy-duty Shure-Set tool, workmen can fasten into concrete or steel with a couple of hammer blows.

Write P-125 on reply card, pg. 17

Leviton grounding devices

Leviton Manufacturing Co., Brooklyn 22, N. Y., has a new 5800 series of 20-amp grounding devices designed to meet the heavy duty requirements of modern equipment, appliances, and portable tools.

The line includes single and duplex receptacles, also available with round covers, and a U-ground cap. Special configurations of both receptacles and cap, in compliance with the 1959 Code revisions, limit use



of electrical equipment to 125 volts and no more than 20 amperes.

The 5800 series permits the higher rated electrical equipment now more widely used in many additional residential, commercial, and industrial uses to obtain their full current requirements, operate more efficiently and safely.

The 5800 series devices are constructed to Leviton heavy duty specification grade standards. They offer features such as shallow bodies, side wiring, break-off links for two-circuit wiring, double grounding screws, and rustproof covers for both 3¼- or 4-inch outlets.

Write P-126 on reply card, pg. 17

Arrow-Hart overload relay

The development of a compact overload relay that compensates for both heat and cold, operating on the same time curve at all temperatures from —20 degrees F to 165 degrees F, is available from the Arrow-Hart & Hegeman Electric Co., Hartford, Conn.

Compensation is completely automatic, so no field adjustment is needed. This performance is made possible by an exclusive Arrow-Hart feature known as "balancing bi-metal," which is located in a separate compartment and is not, therefore, affected by heat applied to the working bi-metal.

The working bi-metal and the compensating bi-metal, identical in size and construction, are joined by a coupling bar. As the ambient temperature rises above 72 degrees F,

Why pay more . . . when you can't buy better?

Always insist on the Name

AMERICAN *Bonded* ARMORED CABLE

American Bonded can't be beaten for handling and installation ease, and long, trouble-free service life. Nothing offers more for your money than American Bonded . . . job tested in thousands of installations the nation over. For the biggest return on your armored cable investment, insist on American Bonded for the best!

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1803 Dallas Ave.
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Dallas Warehouse
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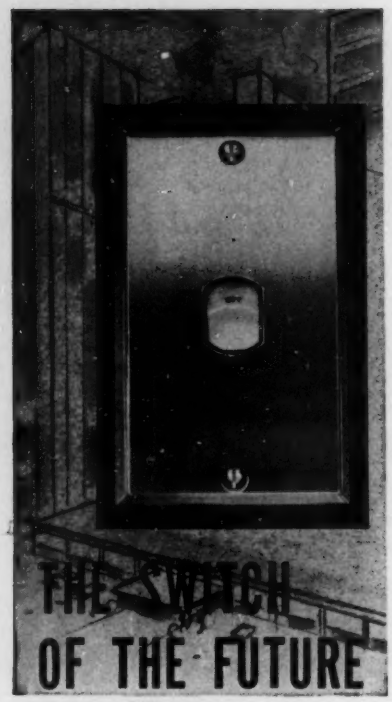
Dallas, Texas



is being used NOW! . . .

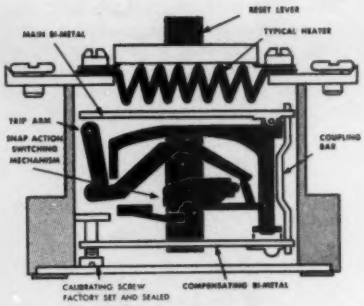
ROCKER-GLO SWITCH

Many of today's switches are specialties primarily designed for appeal in decoration. Others are designed to meet the rugged use and performance called for by a heavy duty switch.
Now, one new switch, Rocker-Glo, combines eye-appealing design with heavy duty performance. So impressed with this combination are architects, engineers and contractors that Rocker-Glo is already being specified in leading hotels, motels, hospitals, commercial buildings and housing developments. Rocker-Glo has high-grade silver alloy contacts. Its modern design and unique construction allow this switch to be pressed, pushed, rocked or rolled into instantaneous action.
Rocker-Glo switches are designed to be used at full current rating on tungsten filament and fluorescent loads. Available in Despard interchangeable type, Despard type mounted on a strap and narrow rocker for tumbler switch plates. A specification grade switch, 15 and 20 amps. 120/277 volts AC.

Write for free Rocker-Glo bulletin — Dept. ES-161.

PASS & SEYMOUR, INC.
SYRACUSE 9, NEW YORK

50 E. 42nd St., New York 17, N.Y. • 1440 N. Pulaski Rd., Chicago 51, Ill. • In Canada; Renfrew Electric Co., Ltd. Toronto, Ontario



the compensating bi-metal operates through the coupling bar to move the working bi-metal in order to maintain its distance from the trip arm. Similarly, as the ambient temperature falls below 72 degrees F, the compensating bi-metal operates to maintain its distance from the trip arm. Therefore, tripping time remains the same regardless of temperature. The switching mechanism itself employs the same positive snap-action featured in all Arrow-Hart overload relays.

The new relay has a calibrating screw that permits precise setting for the exact current required. Set and sealed at the factory, this screw requires no further adjustment.

The new ambient compensated overload relay, according to the manufacturer, answers the need for this type of control in oil and irrigation fields, and roof-top air conditioners and other outdoor installations subjected to wide seasonal or daily changes in ambient temperatures, and for indoor control installations located near boilers, furnaces, heating units, or refrigeration equipment and subjected to wide daily changes in ambient temperature.

Write P-127 on reply card, pg. 17

Arvin baseboard heater

A new compact model baseboard heater unit has been announced by Arvin Industries, Inc., 13th and Big Four Railroad, Columbus, Ind.

The new Invisa-Line baseboard heaters are only 4½ inches high and 1¾ inches deep, despite a watt density set at 140. A tubular sheath or rod-type unit keeps surface temperatures down while providing this high wattage.

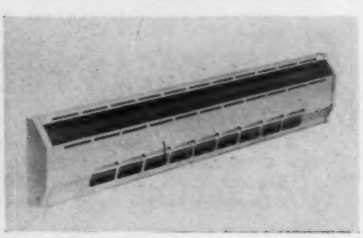
The units feature heat exchangers with sheet metal welded to the tube elements, which eliminates irregular expansion. Bowing of the heat exchanger within the housing is eliminated by flanging the solid pieces of sheet metal.

A staggered fin design "kicks" heat off the element of each heater and into the air, speeding convection of heat into the room.

A highly polished chrome nickel plated steel baffle fitted on the front of each element reflects radiated heat back to the element, where it is convected into the air without heating the front of the unit.

Use of thermal cutouts on the units automatically shuts off any heater section in which the flow of air, either in or out, is blocked. All units are prewired by Arvin.

Write P-128 on reply card, pg. 17



Fluorescent glass plates

A flat, rectangular fluorescent lamp, representing a new concept in fluorescent lighting, has been announced by the Westinghouse Electric Corp., Lamp Div., MacArthur Ave., Bloomfield, N. J.

Westinghouse engineers have developed these large, thin, rectangular glass plates no more than an inch and a half thick, which produce fluorescent light. The unusual lamps actually consist of a labyrinth or maze of passages sealed in a thin glass block. The arc or electric discharge travels this winding path

ONE-TIME FUSE
(Silver-Plated)
The only AC Rated One-Time, tested and proven on AC. U.L. Approved. Competitively Priced. Order now for *Predictable Performance.*

ask for bulletin O-T 601

THE CHASE-SHAWMUT CO.
Subsidiary of I-T-E CIRCUIT BREAKER CO.
374 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

through the glass block to produce, in effect, a large area source of light.

This prototype which Westinghouse plans to mass-produce as soon as the necessary manufacturing equipment is completed, is a foot square and about an inch and a half thick with compact rear contacts. It is designed for use in modular fashion. The 12-inch square models will be 40- to 50-watt lamps. They will produce considerably more light than a 100-watt incandescent bulb.

The lamp will have a reflector on one side so that all the light will be reflected through a single side of the lamp.

Write P-129 on reply card, pg. 17

Zenith warning unit

A new warning unit, especially designed for hospital operating rooms and other locations where hazardous

grounding of isolating voltage systems may be encountered, is now available from Zenith Electric Co., 152 West Walton St., Chicago 10, Ill. U. L.-approved, it will detect a leakage to ground of up to 60,000 ohms, and will allow no more than two milliamps to pass through the isolated voltage system in which it is installed.

A green signal light, located within view of the anaesthetist or other personnel, indicates the normal ungrounded condition of the system. When a ground occurs, a red light goes on and a buzzer sounds a warning that the system is grounded and hazardous. The buzzer may be turned off, but the red light remains on until the fault is corrected.

Write P-130 on reply card, pg. 17

Fused interrupter switch

The Loadmaster 100, a drawout protective device described as a completely new concept for low voltage (600-volt) switchgear, has been announced by Pennsylvania Transformer Division of McGraw-Edison Co., P. O. Box 330, Canonsburg, Pa.

The Loadmaster 100 is an electrically-operated fused interrupter switch utilizing Buss Low-Peak dual-element high interrupting capacity fuses. It has a rated interrupting capacity of 100,000 rms symmetrical amperes to handle the most severe fault conditions. The dual-element fuses have sufficient time-lag to protect against needless circuit interruption caused by harmless overloads.

In addition, the Loadmaster 100 gives complete protection against single-phasing.

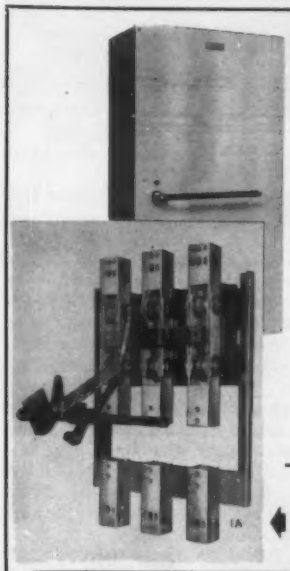
A motor-driven, spring-loaded, trip-free closing mechanism insures

fast positive closing. It may be safely closed into its full fault-interrupting capacity. All Loadmasters are arranged for remote electrical close and trip.

Write P-131 on reply card, pg. 17

Miller aluminum troffers

Comfortable high footcandle lighting for offices, stores, and public buildings, at lower installed and operating costs, are features claimed for new aluminum troffers for Power



For the Electrical Distributor . . .

the KAM-LOK SWITCH

with pressure contacts

IN AN ALL-ALUMINUM WALL-MOUNTED ENCLOSURE FOR USE WITH AMP-TRAP, BUSSMANN OR G-E CURRENT-LIMITING FUSES

. . . Aluminum enclosure is lighter to handle, more compact and completely free from induction heating

. . . Line and load terminals built-in clamps for up to 4 cables per pole in 1200-4000A sizes — same clamps can be used to facilitate bus bar connections

The open KAM-LOK is also sold to switchboard manufacturers for incorporation in their switchboards

1200-6000A 250 and 480 volts 3φ3W or 3φ4W

SALES REPRESENTATIVES THROUGHOUT THE SOUTH

ATLANTA — Edgar E. Dawes & Co., 405 Rhodes Bldg.
(Also Birmingham, Greenville, Tampa, Jacksonville, Cleveland, Tenn.)
DALLAS — Wynne Snoots Co., 2nd Unit Santa Fe Bldg.
(Also Houston, Little Rock, Oklahoma City, Lubbock)
NEW ORLEANS—Associated Manufacturers Agents, 900 Carondelet St.
RICHMOND—Robert W. Fishburne, 1725 Arlington Road (Also Raleigh)
WASHINGTON, D. C. — Ramsey Electric Co., 337 Southern Bldg.

THE KELEK COMPANY

259 DAVIS AVE. NORWOOD, MASS.

Groove lamps, announced by the Miller Co., Meriden, Conn.

They are described as well-shielded recessed troffers designed to provide maximum brightness control of the extra high-output lamps.

According to Miller engineers, the special low brightness 45-degree lengthwise louver combined with the 41-degree crosswise shielding of the light-controlling reflector provides high footcandle levels with the ultimate in comfort.

Write P-132 on reply card, pg. 17

Stonco Electric FS boxes

Three new series of completely interchangeable FS boxes announced by Stonco Electric Products Co., 333 Monroe Ave., Kenilworth, N. J., accommodate virtually every cover, plate, and wiring device on the market today.

Included are weatherproof boxes taper-threaded for rigid conduit, boxes with special "rivet-point" locking set-screws for thin-wall EMT, and a complete specification-grade line with deluxe compression-fittings to cut installation time in half in severe-service locations.

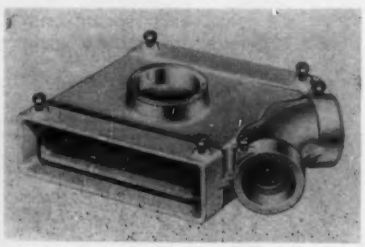
Boxes are precision die-cast aluminum in a new design for greater structural strength with less weight. Built-in extras include grounding screws, inside mounting knockouts,

back drainage "feet" to prevent wall streaking, and exclusive Stonco-design exterior hub construction for maximum wiring space.

Write P-133 on reply card, pg. 17

Duct-to-conduit adapter

Wheatland Electric Products Co., 500 Logan St., Carnegie, Pa., announces that simplified wiring take-offs in underfloor raceway systems have been accomplished by a unique duct-to-conduit adapter which provides lateral take-offs to conduits at 45-degree angles. The new adapter replaces two right-angle fittings for-



merly required to provide two side-conduit openings.

The gray casting adapters have two unusually large conduit openings, 1¼-inch size, each at 45-degree angles to the raceway. The 45-degree angle permits entrance of two conduits to duct or two separate feeds from duct to independent units. The conduit openings may be reduced to smaller sizes of conduit by standard reducers.

Interior surfaces of the fitting are smooth; raised duct stops are ramped to assure continuous flow of conductors through the unobstructed raceway. Set screws lock the ducts and conduits in the fitting and maintain grounding continuity.

Write P-134 on reply card, pg. 17

New product briefs

An economy budget-priced line of incandescent **recessed boxes**, the Jet Line, has been added to the recessed fixtures offered by **Sterling Industries, Inc.**, 5697 Rising Sun Ave., Philadelphia 20, Pa.

They are shallow type boxes constructed of heavy-gauge steel, scientifically vented to prevent excessive heat, and finished in special heat-resistant baked white enamel.

Write P-135 on reply card, pg. 17

American Insulated Wire Corp., 36 Freeman St., Pawtucket, R. I., a subsidiary of Leviton Manufacturing Co., Inc., Brooklyn 22, N. Y., is making a new plastic jacket **non-metallic sheathed cable** which will be sold under the trade name of Amerflex.

This new cable, which is constructed of thermoplastic inner conductors and thermoplastic jacket, is designed to simplify and speed modern wiring because it is easier to pull and strip and offers greater flexibility than previous types of non-metallic sheathed cable.

Additional advantages of Amerflex are its superior impact strength, its improved appearance, and its resistance to flame and moisture.

Write P-136 on reply card, pg. 17

The new Ditch Witch **crawler trencher**, recently introduced by the **Charles Machine Works, Inc.**, 1959 West Fir Ave., Perry Okla., is ideal, according to the company, for digging in rocky or frosty soil conditions.

The crawler is available in either nine- or 12- hp models and is an addition to the now well known rubber tired Ditch Witch machines.

It features a jaw clutch mechanism for ease in steering and maneuvering. It gives a straight trench, fast digging, economical operation.

Write P-137 on reply card, pg. 17

Know the law

(Continued from page 79)

work, and that the electrical contractor should properly coordinate his work with that of the other contractors.

The Supreme Court decided that the fact that city refused to grant the contractor a permit to carry out work under the contract because he did not comply with requirements of city as to licensing electricians did not relieve him from his contractual obligations, and he was liable for damages sustained by the district for his failure to comply with contract.

The Court said that a lower court's decision in favor of the school district must be upheld because the undisputed evidence showed that Thornton, the electrical contractor, "did not and could not continue the work because he did not comply with the requirements of the City of Arlington as to licensing electricians.

Thornton had agreed to obtain all necessary permits and to comply with all building laws, ordin-

ances, and regulations. His failure to do so did not relieve him from his contractual obligations.

Ordinarily, when one contracts to render a performance for which a government license or permit is required, it is his duty to get the license or permit so that he can perform. The risk of inability to obtain it is on him; and its refusal by the government is no defense in a suit for breach of his contract.

COMMENT: It would seem that the same result would have followed had this contract been one for the performance of electrical work on a privately owned building.

Record-making growth

(Continued from page 69)

power plants are now in operation in the United States. Two more are expected to come into operation during 1961, which will bring the total of nuclear-fueled power capacity in the nation to about 760,000 kilowatts by the end of the year.

At the end of 1960 a total of 132 electric power companies were participating in one or more of 26 major projects for the development and construction of atomic power plants and for major research, development, and study projects. This broad program involves a total utility company investment of over $650,000,000.

To meet the power needs of the American people in years to come, the nation's investor-owned electric companies are intensifying their varied research activities. One aspect is reflected in the establishment of a new research division within the EEI organization. This division will be concerned with a number of important research projects of industry-wide interest.

The research efforts of the electric companies are directed towards a multitude of subjects. They include work in all phases of the generation, transmission, distribution, and use of electricity. "Exotic" power sources, such as the fuel cell, the thermionic tube, the thermoelectric generator, and devices making use of the principle of magnetohydrodynamics, are being carefully explored.

One of the chief problems that has faced the electric companies during 1960, and that will continue to face them during 1961, is the problem of rising costs. To combat these costs, electric companies work constantly to increase their efficiency—and the results have been good.

It took ten pounds of coal to produce one kilowatthour of electricity in Edison's early generators. Today, modern power plants are able to produce a kilowatthour of electricity from three-quarters of a pound of coal. Technological improvements such as this, brought about through the efforts of the electric utility companies and the electrical equipment manufacturers, have made it possible for the electric companies to keep their investment per kilowatt down.

During 1960, the Consumers' Price Index reached a point more than double what it was 25 years ago. But the average price per kilowatthour of residential electricity in 1960 was only 2.47 cents —less than half of what it was 25 years ago.

Despite the many services it performs, and the steadily increasing quantities in which it is being used, electricity's place in the family budget is small. The latest available figures show that only 1.3 cents of each dollar spent by American families went for electricity. The ladies spent more than this for cosmetics.

Despite its small cost, the value that electric service provides is great. The record of growth of the nation's electric companies is ample evidence of this fact.

Electric service has done much for the American people in the past, but the electric companies believe even greater possibilities lie ahead. The future holds promise of electrical appliances, equipment, and machines which will make the America of 1960 seem almost primitive.

As use of electricity increases, the electric companies will be ready, as they have been in the past, to supply the abundance of electric power the nation will need.

Sangamo seminar

(Continued from page 72)

This was prior to the general availability of compact unhoused feeder switched capacitor assemblies and only a few new banks of this kind have been installed since the feeder capacitor program has been in effect. These new banks have been installed in a distribution substation or a substation supplying an industrial

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customer having a low power factor load.

In one instance, a 3,150-kvar switched capacitor bank has been installed on the 34.5-kv subtransmission system, connected to the supply bus at a distribution substation. The primary purpose of this installation is to bolster the voltage at the major load terminus of a heavily loaded pair of 34.5-kv subtransmission circuits. This terminus is at the substation at which the switched bank is installed. The capacitor installation was made at this location because it was possible to extend the useful life of the subtransmission circuits with it and improve the voltage not only at the terminal substation but also at an intermediate distribution substation both during normal and emergency conditions. Had the capacitors been located on the 4-kv side of the distribution substation, it would have resulted in upsetting the 4-kv bus voltage excessively.

It is planned to use this type of application more extensively in the future because the system has numerous 34.5-kv subtransmission circuits or areas in which extensive additions may be postponed by the use of such capacitor banks at subtransmission voltage particularly for emergency, or one subtransmission supply circuit out, conditions. Under these conditions, the voltage corrective action of the capacitor bank tends to compensate for the voltage reduction effect of the loss of one circuit due to higher circuit impedance and this usage is therefore quite a natural one.

It is desirable, of course, to so locate the capacitor bank in the subtransmission system that it may be connected under normal conditions, in order to utilize the normal var supplying ability of the capacitor bank.

It has not been necessary nor considered desirable to install shunt capacitor banks on the 138-kv transmission system, Mr. Schroeder said.

Switched capacitors

A comprehensive discussion of the most effective approach to the application of switched capacitors in locations where regulators exercise control of voltages ahead of the capacitor locations was presented by Wendell C. Fowler, of Sangamo. With a series of profile charts, he demonstrated the effect of the capacitors under various conditions.

He explained that the use of capacitors results in raising the voltage at the point where they are connected as compared with the condition that existed before their installation. The amount of their effect on voltage is the product of the capacitive current delivered and the values of reactance found in the system that supplies them. As they are connected farther and farther out on a circuit from the source of power, their effect on voltage increases proportionally.

With fixed capacitors, there is a benefit obtained to allow the distribution along a circuit in quantities that agree with the reactive loads at times of lightest load. With switched capacitors, the cost of switching and control equipment recommends the use of capacitor banks in larger quantities per single installation than was found in the case of fixed units.

Mr. Fowler also discussed the various control signals that can be used to operate switched capacitor banks. Among the special control schemes described was one utilizing voltage as the control signal, but the level at which the voltage control works is altered by a bias introduced by a time switch. If the bias is rather large, then the effect is practically that of time switch control.

High-voltage systems

The application of capacitors on high voltage systems was the subject of E. C. Starr, Bonneville Power Administration, who pointed out that the power capacitor is the economical means to greater utilization and increased efficiency of the transmission investment.

Moderately long transmission circuits can be operated above their surge impedance loadings, provided proper safeguards are incorporated in the planning of the transmission system, but the reactive requirements become substantial and can easily approach two or three times the reactive supplied by the line capacitance. The calculations presented by Mr. Starr indicated that because of the lower cost of capacitor equipment, a higher terminal voltage ratio can be maintained for maximum overall economy by using capacitors rather than rotating equipment.

Mr. Starr also discussed the increased transmission that can be achieved by inserting capacitors in

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(January 1961)

series with line impedances, that is, series capacitors.

Among the conclusions presented by Mr. Starr were the following: that shunt capacitor bank sizes up to 200,000 kva on a single breaker are feasible on 230-kv systems; that gas, vacuum, and oil circuit breakers must be designed with restrike-free interrupting performance in order to be suitable for capacitor switching; that capacitor switchgear when properly applied or backed up may not require fault interrupting ability and can extend the economy of application of capacitors at higher voltage levels; that adequate protection of high voltage shunt capacitor installations can be provided by individual fusing of the capacitor units; and that capacitor switchgear maintenance costs can be a significant factor in the cost of providing the reactive requirements of a system.

Further reports on a series capacitor installation were presented by H. L. Deloney, of Louisiana Power and Light Co. The application described was a high voltage series capacitor bank used as a means of controlling load division between a "super-conductor" 115-kv transmission line operated in parallel with other transmission lines of only one-third the wire size.

"We feel that high voltage series capacitors offer one of the best methods available for controlling load division between parallel lines of widely differing conductivity," Mr. Deloney said. "Each application, of course, will have to be engineered and evaluated on its own merits. Series capacitor banks cannot yet be ordered by catalog numbers.

"Growing utility systems are requiring the movement of larger blocks of power between generating areas, and this is calling for larger and larger conductor sizes and higher voltages. In the installation on our system, we were able to double the effective loading on a $3 million transmission line by the expenditure of only $500,000 for a series capacitor installation.

"The additional transfer capacity gained by the installation of the series capacitor cost about $10 per kw, whereas the average cost of transmission throughout the company is $50 per kw."

Underground applications

Two speakers on the seminar program discussed underground applications of capacitors. C. E. Nelson, of Philadelphia Electric Co., related their experience with the installation of both 240-volt and 2,400-volt capacitors of the submersible type.

Mr. Nelson was followed on the program by H. L. Peterson, of the Austin, Texas, municipal electric distribution department, who presented calculations which justified the capacitor installations on the city's underground secondary network system. His calculations indicated that the unit cost of firm distribution capacity, including primary cables, transformers, and secondary mains, was $75 per kva. The installation of standard network capacitors cost approximately $22 per kva.

The department has experimented, also, with the installation of the Sangamo company's 1 kvar Secovar units. Some 500 of these have been installed at an average cost of $14.50 per kva. Because they are operated at 216 volts instead of the rated 240, the cost per actual kvar of corrective capacity is $18.

The department feels that the units are well justified and plans more installations of these Secovar units.

Financed in the free market, the nation's investor-owned electric companies will be able to meet in full the power needs of all Americans.

Code questions

(Continued from page 41)

applicable?

Answer: None. As many as may be drawn into the conduit, without any limitation, is permitted.

(33) Section 240-17(c).

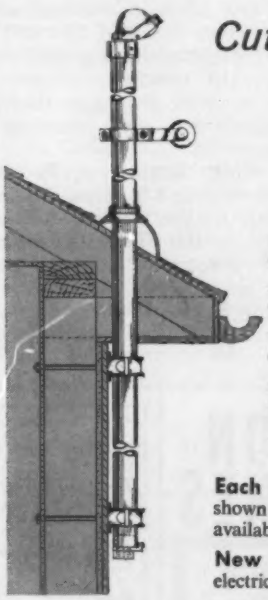
Question: Is there any objection to mounting a standard panel, with vertical busses, in a horizontal position?

Answer: Yes, but if impractical to mount otherwise the inspector may allow it.

(34) **Question:** Would it be permissible to install a 1½-ton air conditioner of the thru-wall type and supply it from a type W.P. receptacle on the outside of the building wall? The circuit breaker used as the disconnecting means is located inside the house.

Answer: Yes, if all other applicable requirements are complied with.

(35) **Statement:** A living room



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contains in its center a chimney and fireplace open from both sides, with its walls extending from floor to ceiling and a mantel over the fireplace openings. It measures approximately 10 feet by 34 inches, leaving 69 inches between one end and the living room wall and 14 inches between it and the other wall.

Question: Would Section 210-22(b) require receptacles on each of the fireplace walls, four in number?

Answer: Yes. Each side and ends would be considered as usable wall spaces.

(36) Section 210-4. A three-wire branch circuit extends from a double pole circuit breaker and connects to supply two 2-wire branch circuits.

Question: Does the code permit multi-wire branch circuits to be connected as described?

Answer: Yes.

(37) Section 730-18(b). Festoon lights hang in front of a used car lot, with a curb stop to prevent cars from driving under the lights.

Question: How high above ground should the lights be?

Answer: If satisfied that clearances of this section is provided by application of Section 730-18(c) it may be applied also.

Lightning arresters

(Continued from page 67)

errors not considered when assuming the maximum severity of surge current that the arresters will be called upon to discharge.

The margins selected will depend upon the cost and importance of the substation and its equipment.

Great danger exists in being overly cautious and compounding factors of safety, resulting in a final combination of insulation levels and arresters that is either impractical or uneconomical. The best basis for selecting a margin is experience.

For example, a margin of 20 per cent has proved adequate for high-voltage transmission on circuits and substations that are shielded against lightning.

Discharge voltage of arresters is dependent upon the magnitude and wave shape of the current that the arrester will be called upon to discharge. The current magnitude and wave shape are, in turn, dependent upon the degree of shielding of the circuits and substation against direct lightning strokes.

(The concluding part of this discussion will be published next month.)

Project EHV

(Continued from page 64)

ductor tension was taken up by a block and winch line.

During the next four years, three different sizes of conductors will be tested. They will be used singly or in bundles of two, three, or four conductors per phase. Interphase spacings will be at 20, 30, 38, 45, and 50 feet. Voltage will vary between 460 and 750 kv.

Each conductor change will require equally precise and special care in order to give data that is meaningful for each conductor variation.

The south section of Project EHV, stretching 3.9 miles, will be connected to the present section and also to the Western Massachusetts Electric Company line when it is completed in mid-1961. Beginning in late 1963 the Project EHV link will be operated by Western Massachusetts as an integral part of their system to supply power for Pittsfield.

Many important differences become evident when comparing Project EHV with the other experimental extra - high - voltage lines operating throughout the world. Perhaps the most important is Project EHV's system of gathering, processing, and analyzing the information obtained on the performance of the prototype transmission system of the future.

A utility engineer once remarked that another extra-high-voltage project had not yet found time to examine or analyze the data collected during the past ten years. He was sure, though, that the reams of paper contained much valuable information. He said that an automatic data processing system such as the one for Project EHV would have solved this problem.

The problem of gathering this data is quite intricate. For example, it is believed that conductor temperature has an important effect on voltage and causes corona losses. But how do you measure temperature accurately when the conductors are 100 feet off the ground and energized at up to a potent 750,000 volts?

In this case General Electric engineers use a radio to transmit temperature readings from the conductors to a receiver on the ground and a telegraphic cable to send them on to the headquarters building.

A further complication is the necessity of reading peak values, average values, or both. Maximum conductor sag and swings are important. However, only the average of corona is needed.

Also, for conductor tensions and wind velocities, knowledge of both the peak and average is required.

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To facilitate these measurements, over 50 analog computers process the data, coming from the instruments, as desired.

The data is collected, converted to digital form, and then punched on paper tape in the headquarters building at the project. Thus, in essence, the $7,500,000 has been spent for holes punched in paper —because, from these holes, the knowledge will come.

Support unit

(Continued from page 43)

by welding a small rubber rimmed wheel to a nut which fits the ¾-inch all-thread stem of the fixture holder. A bushing was installed in the top of the 1¼-inch tubing so that the all-thread stem would fit snugly.

The fixture support frame was made up of ⅜-inch rod and pipe. Fabric belting is the only part of the stand that actually touches the fixture. This prevents scratching the fixture body.

Electrical league

(Continued from page 27)

other meetings. A catering service is available if meals are desired.

When Atlanta civic and social organizations are invited to have their meetings at the league, the only important charge will be for the catering service, if it is used. Groups will be able to use the lounge and IES Hall facilities for a nominal fee made to defray maintenance and upkeep expense.

Other officers of the Atlanta Electrical League are as follows: chairman of the board, Johnnie E. Sweatt, manager of the commercial sales engineering division of Georgia Power; president, Cyrus M. Wallace, Jr., vice-president-sales district for Georgia Power Co.; and vice-president, Hamilton Corey, sales manager for Graybar Electric in Atlanta.

Seven league committee have responsibility for cooking promotion, heating and air conditioning, facilities, exhibitors, residential use, lighting promotion, and membership.

"Those who are exhibitors are members of the Atlanta Electrical League," explained Mr. Horton. "However, we are urging and inviting all segments of the electrical industry to become members, such as contractors, distributors, manufacturers, dealers, and engineering and architectural firms, as well as individuals engaged in the electrical and lighting professions.

In joining it will be possible for them to better identify themselves with the league, and more fully realize the ever-increasing benefits from an operation—nothing quite like it in the country—designed to aid materially the architects and engineers, and educate the public, by lecture and demonstration, in many forms of new electrical products and their application.

"Individual memberships are $12.50 per year, while all other categories are considered as 'sustaining members,' with annual dues ranging from $25 to $100, depending upon their classification.

"The local section of the Illuminating Engineering Society was largely responsible for initiating and organizing this venture, along with the sympathetic and helpful assistance of the allied electrical industries."

All who exhibit at the league can vote in determining its officers, policies, etc. At present the league charges $1.50 per year per square foot of exhibit space, either floor or ceiling, or $3 for both floor and ceiling areas. Officers and committees are chosen once a year.

During the fall of 1959 the league sponsored an educational and instructional course called "Eye-Fi." The course was designed to acquaint contractors and distributors on proper lighting applications. Two meetings a week were held for four weeks.

A Code study group, composed of engineers and contractors, met during the first five months of 1960 to discuss requirements of the National Electrical Code. The group met once a month, and 150 people registered to attend. A special eight-man panel, headed by Dewey L. Johnson, superintendent of electrical affairs for the City of Atlanta, conducted the discussions.

The Electrical Center is under the guidance of the exhibitors committee, whose function is to lease to manufacturers the space available and to organize and make more appealing the existing exhibits, as well as to govern them.

Apprentice program

(Continued from page 24)

morale may receive $1.30 an hour after six months.

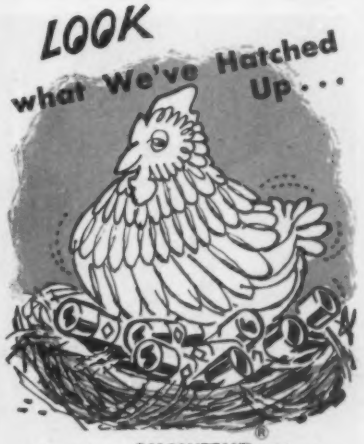
A new apprentice is placed under the supervision of a field mechanic. His first assignments are simple. He is taught to thread pipe, cut holes in a wall, patch, plaster, clean up. He is taught how to handle tools, how to bend pipe with a hydraulic bender. Safety training is incorporated with day-to-day assignments, as are time- and labor-saving procedures.

Supervising instructors do not leave the area of a working apprentice. They are advised against going to another floor of the building and leaving the apprentice on his own.

A supervising mechanic uses an apprentice as fast as he learns. As an apprentice rotates from one supervising mechanic to the next, he learns to install fuses, switches, and other equipment.

As he works side by side with a mechanic installing and servicing lighting circuits and systems, wiring signalling and control circuits and devices, splicing wires and cables, soldering, and trouble-shooting the defective operation of a system, he raises questions, or his supervisor may raise questions to test his understanding of what he is doing.

As I move from job to job on my daily rounds, I observe performance of an apprentice, his at-



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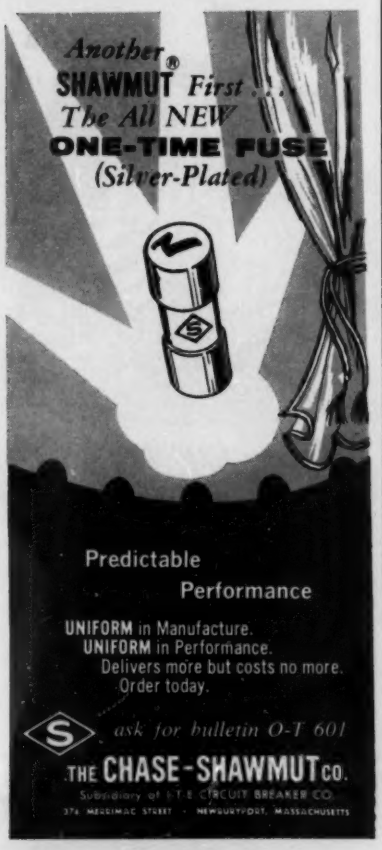

titude, his relation with his supervisor. I instruct, explain, or have a short conference with an apprentice, offer encouragement, or repair a misunderstanding.

I make a special plea of my supervisors for patience and tolerance in working with apprentices. If they will only bear with them, maturity will bring out ultimately latent ability. For I am convinced that even the slowest learner can be developed into a useful and valuable mechanic, provided he is willing, and his supervisor patient and confident. Impatience, irritability, friction can only lose a potentially good man, I impress on them.

Classes are held Wednesday evenings from 8 to 10 and are attended by all employees. Principles and theories of electricity are presented in the first sessions, and followed up with principles of the electric motor and generator. Resistance, capacitance, inductance are explained. We relate theory to problems they are currently encountering on jobs. We invite them to raise questions on why certain procedures were taken on jobs with which they are familiar.

Each apprentice has an electrical Code book, and as we refer to the Code we remind them of theory they have learned and jobs on which they have worked.

Under ethics in customer relations, we discuss their approach and attitude toward a customer and his property. An apprentice learns what he can be held liable for in case of damage.

The more thoroughgoing an apprentice's training is, the better it is for the mechanic and the company. We do not believe that an apprentice or mechanic kept under threat of being fired can produce his best work. We encourage a feeling of security, reassuring our personnel that in slow months work will be found for them around the shop painting, repairing equipment, restoring the premises.

Nor do we burden them with company problems that arise. The more secure they feel in our employ, the happier and more productive they will be. To further their sense of security we are at present working on a retirement program for our employees that we hope to put into effect shortly.

We lose probably no more than 50 per cent of our apprentices within the first two years. (Some of the trainees are high school and college students temporarily employed.) Unlike other trades, the electrical apprentice is not dead weight during the early months of his training. He has made himself useful and does not therefore represent total loss for the company when he pulls up stakes. Although we may have done everything possible to retain him, we do not look upon this early separation as a deterrent to an apprenticeship program.

We take due pride in the outstanding quality of workmanship that comes out of our training program.

An apprenticeship training program fosters loyalty, cooperation, and a high degree of skill—the very components of a growing and successful operation.

Contractors organize

(Continued from page 23)

operation in getting their quotes in on time. (A deadline of four hours prior to bid opening applies to all quotations from suppliers.) I do not believe you will find a supplier who does not now feel that he will secure a purchase order on quoted items if he is low bidder.

But it has been the general contractors' response that has pleased us most. Though there were several efforts made to "shop" bid at first, to my knowledge there has not been a single contract that was not signed at its original quoted price.

Most of the contractors' reactions have been words of praise and admiration for the electrical contractors and their efforts to improve their own and the construction industry's plight.

It is also to be noted that our entire effort has been characterized by a very sincere effort to approach our problems on a basis of equity to all concerned. We were cognizant of the fact that if improvements were to be made, they must be fair and ethical to all parties concerned.

But the electrical industry has not been the only segment benefited. We have been told by mechanical, masonry, and painting contractors that they have received direct benefits. Largely because of our efforts, the mechanical contractors are actively working toward a bid depository. The painting contractors recently organized and are working for a depository. A bid depository system has been set up by the masonry contractors.

I have on my desk at this mo-

ment a request to bid a project by one of the leading contractors of this area. On this request is the following statement: "The low bidder of each subcontract will be notified within three to five days, that contingent upon the signing of a contract by (general contractor), with the owner, his bid will be accepted." Though this statement of policy is from a very reputable contractor, it is indeed a reversal of policy and a direct result of the influence of the Northern Virginia Electrical Contractors Association.

Several other projects on which the association is currently working are:

(1) To develop a uniform wage scale among the association's members and to generally improve management-labor relations.

(2) To improve the coordination of mechanical and electrical installations on the job.

(3) To secure the control of delivery of fixtures on jobs where fixture allowances are involved.

(4) To resist the trend by owners to buy electrical equipment directly from suppliers.

(5) To establish uniform allowances for temporary wiring based on the size of the project.

Feeder costs

(Continued from page 22)

required to increase wire size on the feeders, especially the tray runs.

Aluminum's weight is approximately one-third that of steel. A ten-foot length of four-inch steel conduit weighs 98 pounds, as compared to aluminum conduit's weight of 38 pounds. Copper conductors weigh approximately twice that of an aluminum equivalent ampere rating. For example, a 1,000-foot length of #2/0 copper weighs 658 pounds, as compared to 278 pounds for aluminum size #4/0.

The aluminum tray weight is about one-fourth the weight of steel conduit, and one-half the weight of aluminum conduit, as shown in Figure 6. This comparison is based on equivalent ampere capacity feeders.

The unique all-aluminum feeder combination is now being used. Many commercial and industrial buildings have been converted to these all-aluminum electrical systems after having originally been designed with more costly materials. A greater saving would have

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been realized, in some instances, if aluminum had been considered in the initial design stages.

The typical installation comparison illustrates the complete savings picture broken down in material, labor, and weight. When nearly $800 in material plus labor and over a ton in weight can be saved on one feeder, then certainly it is worth consideration.

The tray type installation cannot be used for all feeder installations because of location hazards but in all cases aluminum conductors in aluminum conduit can be used with the advantages pointed out.

Washington report

(Continued from page 10)

Miles Colean, former government economist who is now a top consultant to the construction industry, predicted that the construction industry would set a record amount of new construction in place in 1961. Colean and the Department of Commerce arrived at their predictions independent of each other.

In its analysis for 1961, the Department of Commerce predicted that:

Outlays for private construction will surge over $40.3 billion. More than half of that amount, $22.6 billion, will be spent for private housing.

Work on private industrial projects will increase about seven per cent. Spending on private office buildings and warehouses will rise about ten per cent. Utilities will spend about four per cent more on construction.

Some $17 billion will be spent in the field of public construction: about seven per cent more will be spent in 1961 on public housing; about eight per cent more will be spent on schools; the number of federal office buildings under construction will rise.

Money in 1961 to finance the $2.2 billion increase in construction will be in ample supply, according to the Department of Commerce.

At the same time that the Department reported its prediction for 1961, it also reported that the rate of private housing starts rose sharply in October. This followed a steep drop in the preceding month.

According to the Department, the housing increase was due to the easing in mortgage credit with lower terms becoming more available.

Although the predictions for the construction in industry in 1961 are optimistic, for the rest of the economy the predictions are different. Economists in Washington expect that a mild recession will continue through the middle of 1961. Then a pick-up will start.

Economic comment

(Continued from page 6)

It has often been stated in this column that the greatest deterrents to continued economic prosperity lie in the fears of people. If people are afraid to buy, or to build, or to undertake research and development, there can be further deterioration of economic activity—gradual at first, but increasing in tempo as lack of confidence gains. This fear must be resisted now.

This is the season for forecasts of economic progress during the year 1961. Due to the many varied problems now on the horizon, any sound analysis of what is to come in the new year is rather futile. Above just a few problems have been indicated, but they are important ones in the analysis of the national economic well-being.

Economists are not in agreement today either upon the economic level of the nation at present or upon the direction in which the activity is moving. It is possible to find just about any forecast or prophecy that one wishes to have. The only sure thing that the best indicators report is that the national economy today is on a readjustment cycle and can move easily either up or down.

Thus, 1961 will largely be what the public makes it; either a period of confident development or one of depressed and retarded condition.

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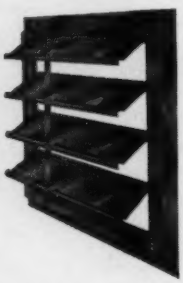

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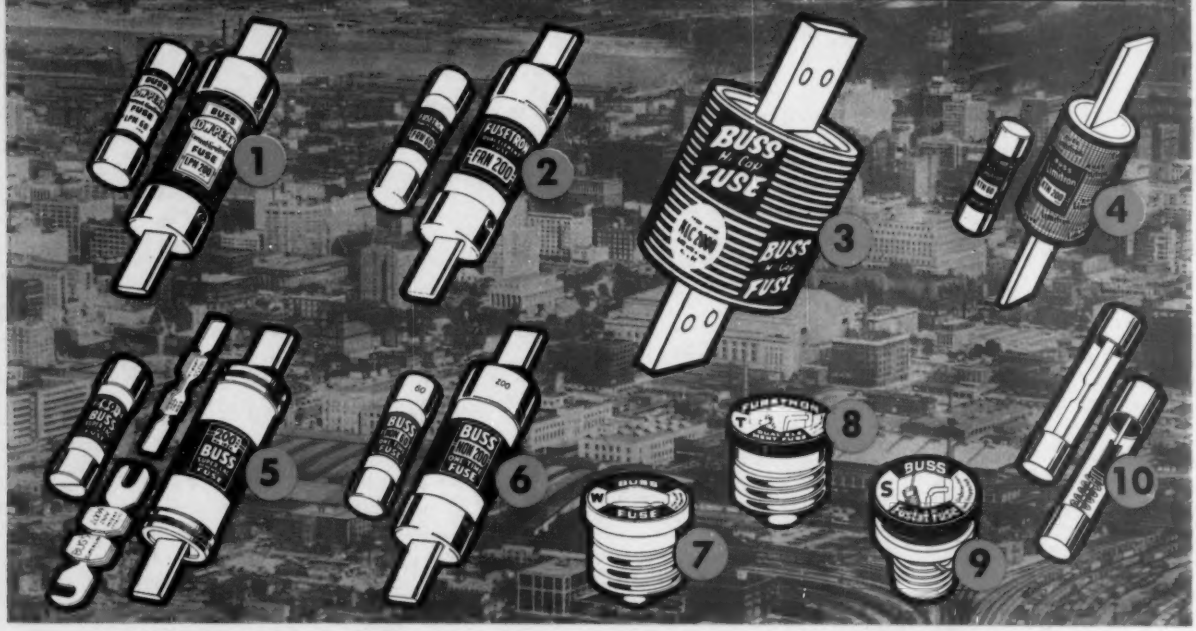

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